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ABSTRACT

This document constitutes the final report of a Curriculum Management Audit of mathematics education in the Montgomery County Public Schools (Maryland). The audit was commissioned by the Montgomery County Public Schools Board of Education/Governing Authority within the scope of its policy-making authority. The audit was conducted June 5-9, 2000. Document analysis was performed off site, as was the detailed analysis of findings and site visit data. A curriculum audit is designed to reveal the extent to which officials and professional staff in a school district have developed and implemented a sound, valid, and operational system of curriculum management. Such a system, set within the framework of adopted board policies, enables the school district to make maximum use of its human and financial resources in the education of its students. When such a system is fully operational, it assures the district taxpayers that their fiscal support is optimized under the conditions in which the school district functions. The report indicates that students in Montgomery County exceeded the achievement levels of Maryland students and students nationally in mathematics. However, not all Montgomery County public school students are experiencing success equally. The recommendations include: (1) restructure system policies, plans, and actions to provide aggressive action to erase the excessive achievement gaps between socio-economic and ethnic groups in mathematics; and (2) redesign and implement a comprehensive and aligned staff development effort to better prepare teachers for improvement of teaching mathematics. (ASK)

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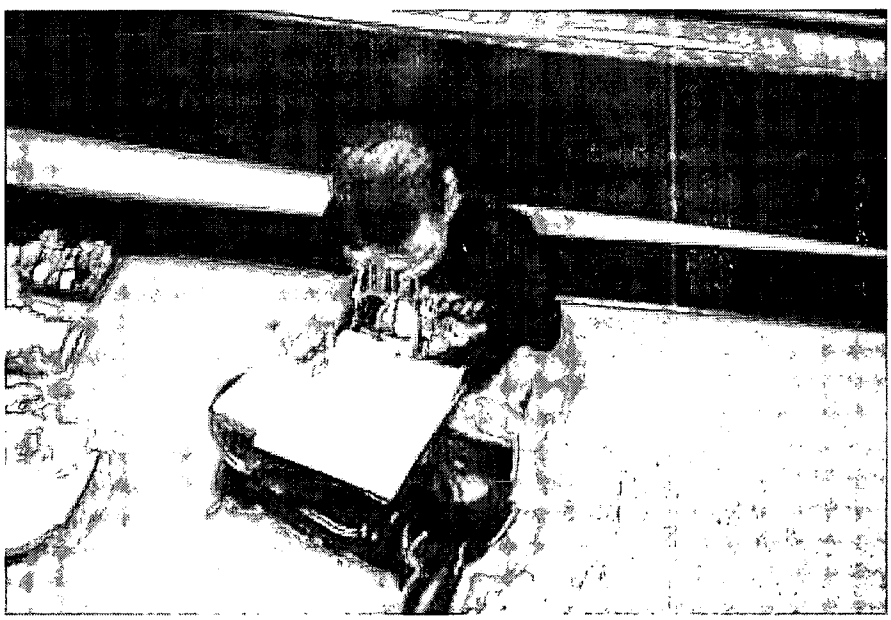
A Curriculum Management Audit of Mathematics Education

in the

MONTGOMERY COUNTY PUBLIC SCHOOLS

Rockville, Maryland



Young Student Working With Math Manipulatives

International Curriculum Management Audit Center
Phi Delta Kappa International

Eighth and Union
Bloomington, Indiana 47404

September 2000

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A Curriculum Management Audit of Mathematics Education

in the

MONTGOMERY COUNTY PUBLIC SCHOOLS

Rockville, Maryland

Conducted Under the Auspices of
International Curriculum Management Audit Center
Phi Delta Kappa International
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A Curriculum Management Audit of Mathematics Education

in the

Montgomery County Public Schools

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A CURRICULUM MANAGEMENT AUDIT

of mathematics education

in the

Montgomery County Public Schools

Rockville, Maryland

I. INTRODUCTION

This document constitutes the final report of a Curriculum Management Audit of mathematics education in the Montgomery County Public Schools. The audit was commissioned by the Montgomery County Public Schools Board of Education/Governing Authority within the scope of its policy-making authority. The audit was conducted during the time period of June 5-9, 2000. Document analysis was performed off site, as was the detailed analysis of findings and site visit data.

This partial curriculum management audit was provided under the auspices of Phi Delta Kappa International (PDK), a not-for-profit professional organization for men and women in education. PDK is headquartered in Bloomington, Indiana, and its 100,000 members include professionals in the field of education including teachers, administrators, college professors, and educational specialists of many types. PDK's focus is to support educators and educational institutions with professional development opportunities, print and video professional materials, and direct services. Among these services is the curriculum management audit, a comprehensive external review of a school system's curriculum management system.

A curriculum audit is designed to reveal the extent to which officials and professional staff of a school district have developed and implemented a sound, valid, and operational system of curriculum management. Such a system, set within the framework of adopted board policies, enables the school district to make maximum use of its human and financial resources in the education of its students. When such a system is fully operational, it assures the district taxpayers that their fiscal support is optimized under the conditions in which the school district functions.

Background

This report comprises a fulfillment of a requested service from the Montgomery County Public Schools, Rockville, Maryland, to evaluate its mathematics education program in all grades. The Montgomery County Public Schools constitute one of Maryland's advancing educational institutions in terms of its willingness to embark on a challenging road to improvement. Even in good school systems, the complexities of the system and the interrelationships of local schools and operational departments affect the quality of educational program delivery and the overall direction of the system. The salient characteristics of a sound curriculum have been recognized by the Montgomery County Public Schools superintendent, Board, and community. This study of mathematics education was requested by the Montgomery County Public Schools Board of Education to determine whether

or not its mathematics programs and services are properly suited for the system, if design of curriculum and instruction is in keeping with appropriate practice, and whether or not the system has sufficient means to make improvements in its performance and results over time.

The purpose of this curriculum external review is to reveal the extent to which officials and professional staff of a school district have developed and implemented a sound, valid, and operational system of curriculum management in mathematics education. Such a system, when fully operational, assures the Governing Board and the Montgomery County Public Schools community that their investment is optimized within the context that the school system must function.

Nature of the School System

The Montgomery County Public Schools are located in Rockville, Maryland and the leadership of the school system includes the following:

Montgomery County Board of Education

Mrs. Patricia O'Neill, Board President
Mr. Kermit V. Burnett, Vice President
Mr. Steve Abrams, Member
Mr. Reginald M. Felton, Member
Mrs. Beatrice B. Gordon, Member
Mrs. Nancy J. King, Member
Ms. Mona M. Signer, Member
Ms. Laura Sampedro, Student Member
Mr. Christopher Lloyd, Student Member (after June 2000)

Superintendent of Schools

Dr. Jerry D. Weast

All members of the Board and the superintendent were invited to be interviewed by the audit team.

The Montgomery County Public Schools, located in an area characterized as suburban Washington, D.C., are comprised of 189 schools including: 124 elementary schools, 35 middle schools, 23 high schools, six alternative schools, and one high school of technology education. Enrollment of the school system in 1999-2000 was 130,689 students. The system is staffed with 384 school-based administrators, 8,174 teachers, 823 professional specialists (counselors, media, etc.), 1,881 instructional support personnel, 1,008 other support personnel, and 1,030 building support personnel. The system is generally considered middle to middle upper class socio-economically, with over 75 percent of its students going on to college and postsecondary education. Student attendance exceeds 95 percent, and the student dropout rate is less than two percent per year. Total appropriated budget for the Montgomery County Public Schools in 1999-2000 was $1,107,216,666.

Background Purpose and Scope of the Work

The Curriculum Management Audit is a process that was developed by Dr. Fenwick W. English and first implemented in 1979 in the Columbus Public Schools, Ohio. The audit is based upon generally accepted concepts pertaining to effective instruction and curricular design and delivery, some of which have been popularly referred to as the "effective schools research."

A curriculum management audit is an independent examination of three data sources: documents, interviews, and site visits. These are gathered and triangulated, or corroborated, to reveal the extent to which a school district is meeting its goals and objectives, whether they are internally or externally developed or imposed. A public report is issued as the final phase of the auditing process.

The audit's scope is centered on curriculum and instruction, and any aspect of operations of a school system that enhances or hinders its design and/or delivery. The audit is an intensive, focused, "postholed" look at how well a school system such as Montgomery County Public Schools has been able to set valid directions for pupil accomplishment and well being, concentrate its resources to accomplish those directions, and improve its performance, however contextually defined or measured, over time.

The Curriculum Management Audit does not examine any aspect of school system operations unless it pertains to the design and delivery of curriculum. For example, auditors would not examine the cafeteria function unless students were going hungry and therefore were not learning. It would not examine vehicle maintenance charts, unless buses continually broke down and children could not get to school to engage in the learning process. It would not be concerned with custodial matters, unless schools were observed to be unclean and unsafe for children to be taught.

Briggs Chaney Middle School Teacher Working with Small Group

The Curriculum Management Audit centers its focus on the main business of schools: teaching, curriculum, and learning. Its contingency focus is based upon data gathered during the audit which impinges negatively or positively on its primary focus. These data are reported along with the main findings of the audit.

In some cases, ancillary findings in a curriculum management audit are so interconnected with the capability of a school system to attain its central objectives, that they become major, interactive forces which, if not addressed, will severely compromise the ability of the school system to be successful with its students.

Curriculum management audits have been performed in hundreds of school systems in more than twenty-five states, the District of Columbia, and several other countries, including Canada, Saudi Arabia, New Zealand, Bangladesh, Malaysia, and Bermuda.

The methodology and assumptions of the Curriculum Management Audit have been reported in the national professional literature in the past decade, and at a broad spectrum of national education association conventions and seminars.

Phi Delta Kappa's International Curriculum Management Audit Center has an exclusive contractual agreement with Curriculum Management Audit Centers, Inc. (CMAC - a public corporation

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incorporated in the State of Delaware, and owner of the copyrights to the intellectual property of the audit process), for the purpose of conducting audits for educational institutions, providing training for auditors and others interested in the audit process, and officially assisting in the certification of PDK curriculum auditors.

This audit was conducted in accordance with a contract with Montgomery County Public Schools and Phi Delta Kappa International. The International Curriculum Management Center, Inc certified all members of the team.

The names of the curriculum auditors in this audit included the following individuals:

- Dr. William K. Poston Jr., Senior Lead Auditor, Ames, Iowa
- Dr. Jacqueline Mitchell, Lead Auditor, Decatur, Georgia
- Dr. Charles Chernosky, Auditor, Coppell, Texas
- Dr. Beverly Nichols, Auditor, Shawnee Mission, Kansas
- Dr. Zollie Stevenson, Washington, D.C.
- Ms. Carla Kirkland, Madison, Mississippi
- Ms. Gina Marx, Wichita, Kansas

Biographical information about the auditors is found in the appendix.

System Purpose for Conducting the Audit

In 1991, the Montgomery County Public Schools Superintendent and Board of Education adopted Success for Every Student" and academic priorities. These goals, which were re-affirmed in April 1999, include the following:

Goal 1: Ensure success for every student,
Goal 2: Provide an effective instructional program,
Goal 3: Strengthen productive partnerships for education, and
Goal 4: Create a positive work environment in a self-renewing organization.

As a part of its "Call to Action," the Superintendent and Board have requested this audit of the mathematics curriculum by the International Curriculum Management Audit Center, Phi Delta Kappa, in order to determine if these goals are being met. The Board and Superintendent have described this audit as an "independent, external analysis of the design and delivery of the mathematics curriculum in Montgomery County Public Schools to ensure design and delivery of high quality, rigorous, standards-based curriculum in mathematics." (*Broadening the Concept of Literacy – Action 11,* Page 13).

Approach of the Audit

The Curriculum Management Audit has established itself as a process of integrity and candor in assessing public school districts. It has been presented as evidence in state and federal litigation concerning matters of school finance, general resource managerial effectiveness, and school desegregation efforts in Kansas, Kentucky, New Jersey, and South Carolina. The audit served as an important data source in state-directed takeovers of school systems in New Jersey and Kentucky. The curriculum management audit has become recognized internationally as an important, viable, and valid tool for the improvement of educational institutions and for the improvement of curriculum design and delivery.

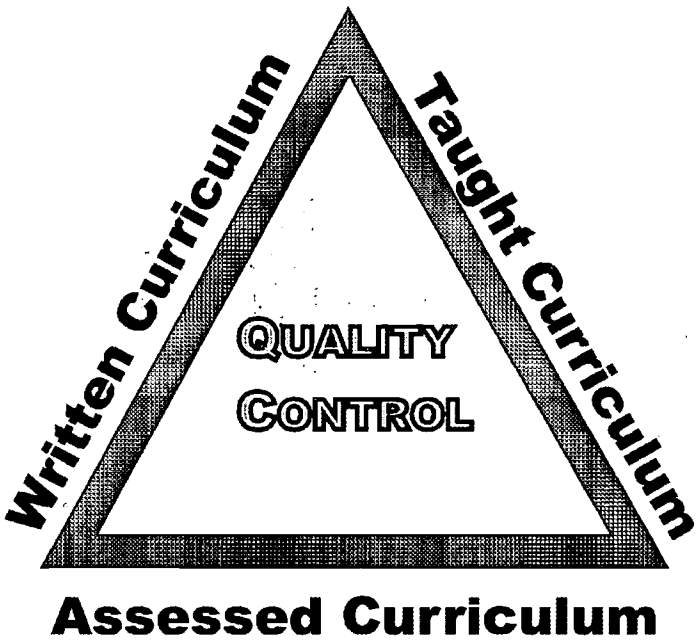
The curriculum management audit represents a "systems" approach to educational improvement, that is, it considers the system as a whole rather than a collection of separate, discrete parts. The interrelationships of system components and their impact on overall quality of the organization in accomplishing its purposes are examined in order to "close the loop" in curriculum and instructional improvement.

II. METHODOLOGY

The Model for the Curriculum Management Audit

The model for the Curriculum Management Audit is shown in the schematic below. The model has been published widely in the national professional literature, most recently in the best selling book, *The Curriculum Management Audit: Improving School Quality* (1995, Frase, English, Poston).

A Schematic View of Curricular Quality Control



General quality control assumes that at least three elements must be present in any organizational and work-related situation for it to be functional and capable of being improved over time. These are: (1) a work standard, goal/objective, or operational mission; (2) work directed toward attaining the mission, standard, goal/objective; and (3) feedback (work measurement), which is related to or aligned with the standard, goal/objective, or mission.

When activities are repeated, there is a "learning curve," i.e., more of the work objectives are achieved within the existing cost parameters. As a result, the organization or a sub-unit of an organization, becomes more "productive" at its essential short- or long-range work tasks.

Within the context of an educational system and its governance and operational structure, curricular quality control requires: (1) a written curriculum in some clear and translatable form for application by teachers in classroom or related instructional settings, (2) a taught curriculum which is shaped by and interactive with the written one, and (3) a tested curriculum which includes the tasks, concepts, and skills of pupil learning which are linked to both the taught and written curricula. This model is applicable in any kind of educational work structure typically found in mass public educational systems, and is suitable for any kind of assessment strategy, from norm-referenced standardized tests to more authentic approaches.

The Curriculum Management Audit assumes that an educational system, as one kind of human work organization, must be responsive to the context in which it functions and in which it receives support for its continuing existence. In the case of public educational systems, the support comes in the form of tax monies from three levels: local, state, and federal.

In return for such support, mass public educational systems are supposed to exhibit characteristics of rationality, i.e., being responsive to the public will as it is expressed in legally constituted bodies such as Congress, state legislatures, and locally elected/appointed boards of education.

In the case of emerging national public school reforms, more and more this responsiveness is assuming a distinctive school-based management focus which includes parents, teachers, and, in some cases, students. The ability of schools to be responsive to public expectations, as legally expressed in law and policy, is crucial to their survival as publicly-supported educational organizations in the years ahead. The Curriculum Management Audit is one method for ascertaining the extent to which a school system or subunit thereof, has been responsive to these expressed expectations and requirements in its context.

Standards for the Auditors

While a Curriculum Management Audit is not a financial audit, it is governed by some of the same principles. These are:

Technical Expertise

CMAC certified auditors must have actual experience in conducting the affairs of a school system at all levels audited. They must understand the tacit and contextual clues of sound curriculum management.

The Montgomery County Public Schools Curriculum Management Audit Team included auditors who have been school superintendents, assistant superintendents, directors, coordinators, principals and assistant principals, as well as elementary and secondary classroom teachers in public educational systems in several locations:

The Principle of Independence

None of the Curriculum Management Audit Team members had any vested interest in the findings or recommendations of the Montgomery County Public Schools Curriculum Management Audit. None of the auditors has any working relationship with the individuals that occupied top or middle management positions in the Montgomery County Public Schools, nor with any of the past or current members of the Montgomery County Public Schools Board of Education.

The Principle of Objectivity

Events and situations, which comprise the database for the curriculum management audit, are derived from documents, interviews, and site visits. Findings must be verifiable and grounded in the database; though confidential interview data may not indicate the identity of such sources. Findings must be factually triangulated with two or more sources of data, except when a document is unusually authoritative such as a court judgment, a labor contract signed and approved by all parties to the agreement, approved meeting minutes which connote the accuracy of the content, or any other document whose verification is self-evident.

Triangulation of documents takes place when the document is requested by the auditor and is subsequently furnished. Confirmation by a system representative that the document is in fact what was requested is a form of triangulation. A final form of triangulation occurs when the audit is sent to the superintendent in draft form. If the superintendent or his/her designee(s) does not provide

evidence that the audit text is inaccurate, or provides documentation that indicates there are omissions or otherwise factual or content errors, the audit is assumed to be triangulated. The superintendent's review is not only an additional source of triangulation, but is considered summative triangulation of the entirety of audit.

The Principle of Consistency

All CMAC-certified Curriculum Management Auditors have used the same standards and basic methods since the initial audit was conducted many years ago. Audits are not normative in the sense that one school system is compared to another. School systems, as the units of analysis, are compared to a set of standards and positive/negative discrepancies cited.

The Principle of Materiality

CMAC-certified auditors have broad implied and discretionary power to focus on and select those findings which they consider most important to describing how the curriculum management system is functioning in a school district, and how that system must improve, expand, delete, or re-configure various functions in order to attain an optimum level of performance.

The Principle of Full Disclosure

Auditors must reveal all relevant information to the users of the audit, except in cases where such disclosure would compromise the identity of employees or patrons of the system. Confidentiality is respected in audit interviews.

In reporting data derived from site interviews, some descriptive terms are used which lack a precise quantifiable definition. For example:

"Some school principals said that ... "

"Many teachers expressed concern that ... "

"There was widespread comment about ... "

The basis for these terms is the number of persons in a group or class of persons who were interviewed, as opposed to the total potential number of persons in a category. This is a particularly salient point when not all persons within a category are interviewed. "Many teachers said that...," represents only those interviewed by the auditors, or who may have responded to a survey, and not "many" of the total group whose views were not sampled, and therefore could not be disclosed during an audit.

In general these quantifications may be applied to the principle of full disclosure:

Descriptive Term	General Quantification Range
Some ... or a few ...	Less than a majority of the group interviewed and less than 30 percent.
Many ...	Less than a majority, more than 30 percent of a group or class of people interviewed.
A majority ...	More than 50 percent, less than 75 percent.
Most ... or widespread	75-89 percent of a group or class of persons interviewed.
Nearly all ...	90-99 percent of those interviewed in a specific class or group of persons.
All or everyone ...	100 percent of all persons interviewed within a similar group, job, or class.

It should be noted for purposes of full disclosure that some groups within a school district are almost always interviewed in toto. The reason is that the audit is focused on management and those people who have policy and managerial responsibilities for the overall performance of the system as a system. In all audits an attempt is made to interview every member of the Board of Education and all top administrative officers, all principals, and the executive board of the teachers association or union. While teachers and parents are interviewed, they are considered in a status different from those who have system-wide responsibilities for a district's operations. Students are rarely interviewed unless the system has made a specific request in this regard.

Interviewed Members of the Montgomery County Public Schools

Superintendent	School Board Members
A sample of principals	Parents (voluntary, self-referred)
K-12 Teachers (voluntary, self-referred)	Students (during site visit)
Mathematics instructional specialists	District administrators (selected)
Mathematics faculty and staff	Assessment specialists

Approximately100 individuals were interviewed during the site visit phase of the audit.

Data Sources of the Curriculum Management Audit

A curriculum audit uses a variety of data sources to determine if each of the three elements of curricular quality control is in place and connected one to the other. The audit process also inquires as to whether pupil learning has improved as the result of effective application of curricular quality control.

The major sources of data for the Montgomery County Public Schools Curriculum Management Audit were:

Documents

These sources consisted of written board policies, administrative regulations, curriculum guides, memoranda, budgets, state reports, accreditation documents, and any other source of information which would reveal elements of the written, taught, and tested curricula and the linkages among these elements.

Interviews

Interviews are conducted by auditors to explain contextual variables which are operating in the school system at the time of the audit. Such contextual variables may shed light on the actions of various persons or parties, reveal interrelationships and explain existing progress, tension, harmony/disharmony within the school system. Quotations cited in the audit from interviews are used as a source of triangulation and not as summative averages or means. Some persons because of their position, knowledge, or credibility, may be quoted more than once in the audit, but they are not counted more than once because their inclusion is not part of a quantitative/mathematical expression of interview data.

Site Visits

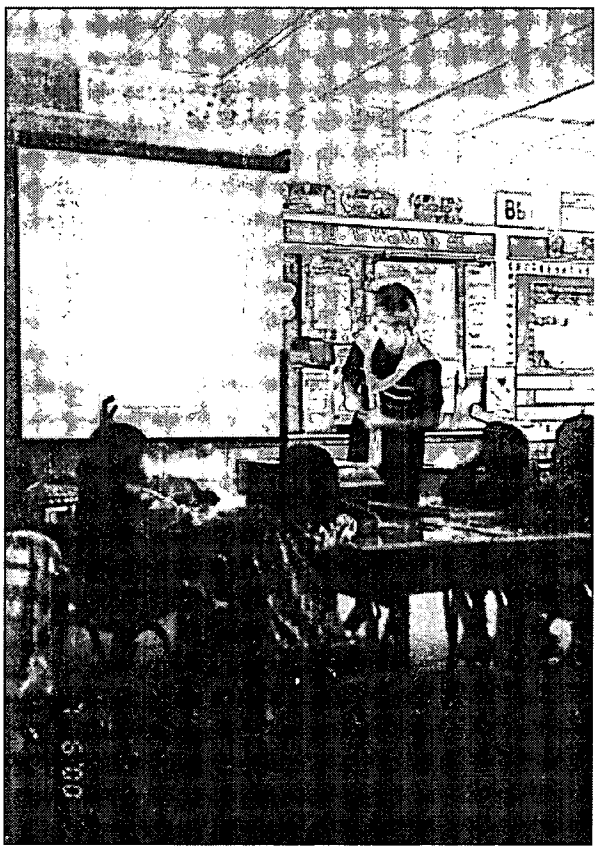
A random selection of 27 building sites, including five high schools, six middle schools, and 16 elementary schools, were toured by the PDK audit team. Site visits reveal the actual context in which curriculum is designed and delivered in a school system. Contextual references are important as they indicate discrepancies in documents or unusual working conditions. Auditors attempted to observe briefly all classrooms, gymnasiums, labs, playgrounds, hallways, rest-rooms, offices, and maintenance areas to properly grasp accurate perceptions of conditions, activities, safety, instructional practices, and operational contexts.

Standards for the Curriculum Audit

The PDK Curriculum Management Audit used three standards against which to compare, verify, and comment upon the Montgomery County Public Schools's existing curricular management practices. These standards have been extrapolated from an extensive review of management principles and practices and have been applied in all previous curriculum management audits.

As a result, the standards reflect an ideal management system, but not an unattainable one. They describe working characteristics that any complex work organization should possess in being responsive and responsible to its clients.

A school system that is using its financial and human resources for the greatest benefit of its students is a district that is able to establish clear objectives, examine alternatives, select and implement alternatives, measure results as they develop against established objectives, and adjust its efforts so that it achieves a greater share of the objectives.



Briggs Chaney Middle School
Math Lesson in Progress

The Three Standards

The three standards employed in the PDK Curriculum Management Audit in Montgomery County Public Schools were:

I. **Direction and Learner Expectations.** The school district has established clear and valid objectives for students and clientele.

II. **Assessment and Feedback.** The school system has used the results from district-designed or adopted assessments to adjust, improve, or terminate ineffective practices or programs.

III. **Connectivity and Consistency.** The school system demonstrates internal connectivity and rational equity in its program development, implementation, and results.

A finding within a Curriculum Management Audit of Mathematics Education is simply a description of the existing state, negative or positive, between an observed and triangulated condition or situation at the time of the PDK audit, and its comparison with one or more of the five audit standards. Special education student and English language learners were not included in the audit analyses.

Findings in the negative represent discrepancies below the standard. Findings in the positive reflect meeting or exceeding the standard. As such, audit findings are recorded on nominal and ordinal indices and not ratio or interval scales. As a general rule, audits do not issue commendations, because it is expected that a school district should be meeting every standard as a way of normally doing its business. Commendations are not given for good practice. On occasion, exemplary practices may be cited.

Unlike accreditation methodologies, audits do not have to reach a forced, summative judgment regarding the status of a school district or sub-unit being analyzed. Audits simply report the discrepancies and formulate recommendations to ameliorate them.

STANDARD I: A School System Has Established Clear and Valid Objectives for Students.

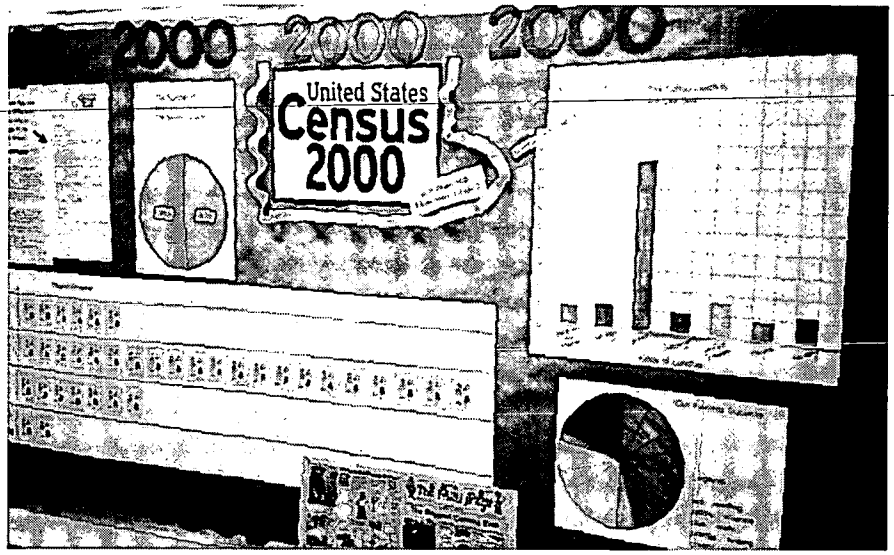
A school system meeting this audit standard has established a clear, valid, and measurable set of pupil standards for learning and has set the objectives into a workable framework for their attainment.

Unless objectives are clear and measurable, there cannot be a cohesive effort to improve pupil achievement in the dimensions in which measurement occurs. The lack of clarity and focus denies to a school system's educators the ability to concentrate scarce resources on priority targets. Instead, resources may be spread too thin and be ineffective in any direction. Objectives are, therefore, essential to attaining local quality control via the School Board. An educational system meeting Standard 1 demonstrates clearly established learner expectations and definitions of instructional content for effective teaching and learning.

What the Auditors Expected to Find in the Montgomery County Public Schools

The auditors expected to find a comprehensive, valid, and approved system-wide set of expectations for all learners in mathematics education, pre-K through the twelfth grade, which demonstrates the following characteristics:

- A clearly established, system-wide set of goals and objectives that addresses all programs and courses and is adopted by the Board of Education;
- Demonstration that the system is contextually responsive to national, state, and other expectations as evidenced in local initiatives;
- Operations set within a framework that carries out the system's goals and objectives;
- Evidence of comprehensive, detailed, short- and long-range curriculum management planning;
- Knowledge, local validation, and use of current best curricular practices;
- Written curriculum that addresses both current and future needs of students;
- Major programmatic initiatives designed to be cohesive;
- Provision of explicit direction for the superintendent and professional staff; and
- A framework that exists for systemic curricular change.



Watkins Mill Elementary School Math in Context

STANDARD II: A School System Uses the Results from System-Designed and/or -Adopted Assessments to Adjust, Improve, or Terminate Ineffective Practices or Programs.

A school system meeting this audit standard has designed a comprehensive system of assessment/testing and uses valid measurement tools that indicate how well its students are achieving designated priority learning goals and objectives. Common indicators are:

- A formative and summative assessment system linked to a clear rationale in board policy,
- Knowledge, local validation, and use of current curricular and program assessment best practices,
- Use of a student and program assessment plan which provides for diverse assessment strategies for varied purposes at all levels -- district, school, and classroom,
- A way to provide feedback to the teaching and administrative staffs regarding how classroom instruction may be evaluated and subsequently improved,
- A timely and relevant database upon which to analyze important trends in student achievement,
- A vehicle to examine how well specific programs are actually producing desired learner outcomes or results,
- A database to compare the strengths and weaknesses of various programs and program alternatives, as well as to engage in equity analysis,
- A database to modify or terminate ineffective educational programs,
- A method/means to relate to a programmatic budget and enable the school system to engage in cost-benefit analysis, and
- Organizational data gathered and used to continually improve system functions.

A school system meeting this audit standard has a full range of formal and informal assessment tools that provide program information relevant to decision-making at classroom, building (principals and school-site councils), system, and board levels.

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A school system meeting this audit standard has taken steps to ensure that the full range of its programs is systematically and regularly examined. Assessment data have been matched to program objectives and are used in decision-making.

What the Auditors Expected to Find in the Montgomery County Public Schools

The auditors expected to find a comprehensive assessment program for all aspects of the curriculum, pre-K through the twelfth grade, which:

- Was keyed to a valid, officially adopted, and comprehensive set of goals/objectives of the school district,
- Was used extensively at the site level to engage in program review, analysis, evaluation, and improvement,
- Was used by the policy-making groups in the system and the community to engage in specific policy review for validity and accuracy,
- Became the foci and basis of formulating short- and long-range plans for continual improvement,
- Was used to establish cost and select needed curriculum alternatives, and
- Was publicly reported on a regular basis in terms that were understood by the key stakeholders in the community.

STANDARD III: A School System Demonstrates Internal Connectivity and Rational Equity in Its Program Development and Implementation.

A school system meeting this Curriculum Management Audit standard is able to show how its program has been created as the result of a systematic identification of deficiencies in the achievement and growth of its students compared to measurable standards of pupil learning.

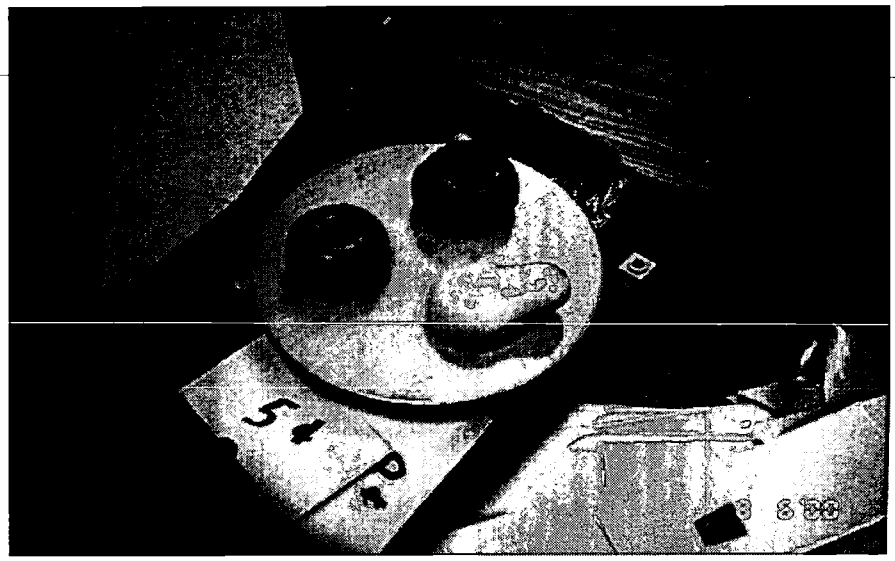
In addition, a school system meeting this standard is able to demonstrate that it possesses a focused and coherent approach toward defining curriculum and that, as a whole, it is more effective than the sum of its parts, i.e., any arbitrary combinations of programs or schools do not equate to the larger school system entity.

The purpose of having a school system is to obtain the educational and economic benefits of a coordinated and focused program for students, both to enhance learning which is complex and multi-year in its dimensions, and to employ economies of scale where applicable.

What the Auditors Expected to Find in the Montgomery County Public Schools

The PDK auditors expected to find a highly developed, articulated, and coordinated curriculum in the school system that was effectively monitored by the administrative and supervisory staffs at the central and site levels. Common indicators are:

- Documents/sources that reveal internal connections at different levels in the system,
- Predictable consistency through a coherent rationale for content delineation within the curriculum,
- Equity of curriculum/course access and opportunity,
- Allocation of resource flow to areas of greatest need,
- A curriculum that is clearly explained to members of the teaching staff and building-level administrators and other supervisory personnel,
- Specific professional development programs to enhance curricular design and delivery,
- A curriculum that is monitored by central office and site supervisory personnel, and
- Teacher and administrator responsiveness to school board policies, currently and over time.



Takoma Park Elementary School "Fruit Fractions"

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III. FINDINGS

Finding 1: System Goal to "Ensure Success for Every Student" Is Not Being Met Effectively and Tracking by Ability Limits Achievement of Under-performing Ethnic Groups in Mathematics.

A well-managed school system reflects a strong commitment to both consistency and equity. Equity is defined as the state, action, or principle of treating people in accordance with differential needs. This contrasts to the notion of equality, which is the quality or condition of being treated exactly the same as everything else. Equity and fairness to all students is expected in areas such as promotion and retention, student placement, and discipline. Resources will be distributed equitably across the district to ensure that individual differences in students are given due consideration and care. It is also expected that facilities will be equitable across the district, thus consistently creating an environment conducive to learning. Personnel demographics will also show the result of rigorous efforts to ensure racial balance.

The auditors examined a number of documents; interviewed board members, staff, parents, and community members; and conducted site visits to a random sample of 27 schools (16 elementary, six middle, and five high schools) in the Montgomery County Public Schools. The auditors' approach was to review documents such as board policy and other written documents provided by staff, and then to compare these written organizational expectations regarding equity to the reality of day-to-day operations, observed from data, interviews, and site visits. The auditors examined system equity in courses and program-quality access, staffing, facilities, resource allocations, placement activities, service delivery, and other areas of district operations relevant to equity.

Many inequities were found and are reported in Finding 2. These were in the areas of student achievement, student discipline, student placements, and staffing ratios.

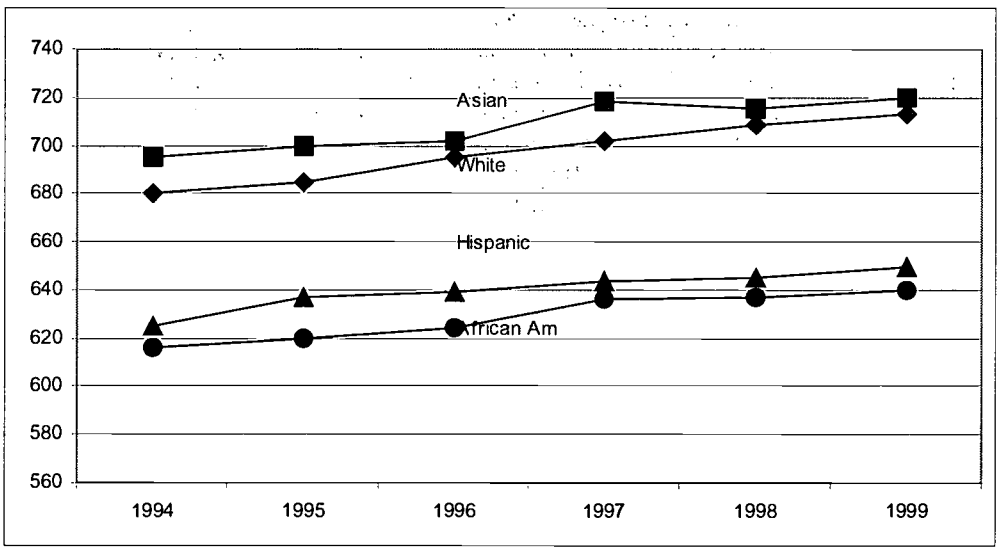
Oak View Elementary School Chalk Talk in Math

The auditors found that the expectations of the system for all children fall short of realization and that dramatic differences exist in mathematics and ethnic classification groups. The Board of Education Goals state "each student will be able to communicate effectively, obtain and use

information, solve problems, and engage in active, life-long learning." Moreover, the goals also require that, "Instruction must include a variety of teaching strategies and technologies, actively involve students, and result in their mastery of learning objectives." In the system's strategic plan, "Success for Every Student" (approved by the Board of Education and re-affirmed in 1999), it states that "all children must...analyze data, and solve complex problems...(and schools) must provide a technology-rich instructional program." These goals were found to be inadequately met by Montgomery County Public Schools in mathematics.

Definitive gaps in achievement were evident between racial and ethnic groups in mathematics, and student placement practices based on academic achievement resulted in grouping along racially identifiable lines. These gaps are evident in the data shown in Exhibit 1.1 below, which is the performance of racial/ethnic groups on a Montgomery County Public Schools criterion-referenced mathematics test over a five-year period at the fifth grade level.

Exhibit 1.1
Racial/Ethnic Differences in CRT Math Scores (Grade 5)
Montgomery County Public Schools



Student achievement gaps between White and African American students in the Montgomery County Public Schools have been recognized for over a decade. These gaps continue as of the time of this curriculum management audit of mathematics education. Although goals have been set for many years to reduce the gap and to increase overall student achievement, the strategies employed have not altered the declining scores. Ethnicity remains an equity factor in student achievement.

- African American student achievement has remained consistently below White and Asian students, and the discrepancies between groups reflect ineffective curriculum and instructional practices in addressing achievement gaps.
- Board, administration, and site efforts to increase student achievement have not produced the desired results.

- Class placement practices have created a de facto "tracking system" which reflects separation of economic and racial groups.[1]
- Strategies for grouping in mathematics result in inordinate and imprecise placements with as many as 30 percent of the second grade eligible for gifted and talented groups, with other students placed in "regular" programs.
- Inequities begin at placement despite the problems accompanying such practice.[2]

The course placement procedures in Montgomery County result in inequity, with students who are placed in the lower-ability groups suffering the most. Several interviews revealed the following comments about the Montgomery County grouping system which support this finding:

- "[Our] tracking is very disturbing to me." (administrator)
- "A lot of our math teachers are not certified in math. I put [my weakest] teacher with the low group because [the teacher] isn't strong in math." (middle school principal)
- "Teachers don't encourage us – everyone knows one class was higher than the others and we weren't (sic) treated like we didn't count." (middle school student in "middle" track)
- "Some kids feel cheated and want to get out (of the low track)." (student)
- "Expectations are lessened for the lower groups. We slow down the pace." (principal)
- "(There) is a river of denial that there is a problem." (administrator)
- "[We follow] Simpson's paradox here." (Increasing proportion of under-performing students) (central office administrator).
- "Every school gets the same programs (no differentiation across schools based on differential needs of students)." (central office administrator)
- "Parents can override our placement, but I try to talk them out of it." (principal)

Visitations to schools confirmed the extensive, nearly uniform, practice of homogeneous grouping in mathematics despite research evidence undermining the credibility of the practice.[3] Lower track classes were more likely to be made up of minority and low-income students, and the lower track classes were receiving a different, less academically challenging, curriculum.

The auditors found several examples of inequities existing in the Montgomery County Public Schools due in large part to ability grouping in mathematics (see Finding 2). Data analyzed indicate inequities in student achievement, grading practices, and course placement in mathematics throughout the district.

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[1] "Tracking" is defined as "dividing students into class-size groups based on a measure of the students' perceived ability or prior achievement." (George P.S. [1988] *What's the truth about tracking and ability grouping really???* Gainsville, FL: University of Florida).

[2] In its review of research, the Massachusetts Board of Education found that "significant percentages of students may be misclassified because of imperfections of tests, the use of tests as a sole predictor of achievement, and placement procedures that are not sensitive to race, class, gender, language and special needs differences. (Massachusetts Board of Education (1990), *Structuring Schools for Student Success: A Focus on Ability Grouping*. Boston: Author).

[3] A meta-analysis of studies examining the effects of ability grouping on achievement of secondary students (middle, junior high, and high school) indicated in comparisons of ability groups and heterogeneous groups over a period of from one semester to five years, overall achievement differences were essentially zero at all grade levels. (Slavin, R.E [1990] Ability grouping and student achievement in secondary schools: A best evidence synthesis. *Review of Educational Research* pp. 60, 471-499).

Finding 2: Equity and Equality of Opportunity Are Inadequate -- Substantial Gaps Are Apparent in the Level of Success Experienced by Various Student Groups.

Whatever a school system can do for the best of its children, it must do for all of its children. Fairness and justices require equal success despite widely difference needs. In delivery of instruction, equal provision of time, material, and activities would be inequitable and unfair if the clientele have different needs or levels of preparation for learning. More importantly, socio-economic status, ethnicity, and gender must not be predictors of student achievement if the school district is meeting differential needs of its students. Equity and fairness to all students must be apparent in areas such as student placement in enrichment programs and access to advanced courses and levels of instruction.

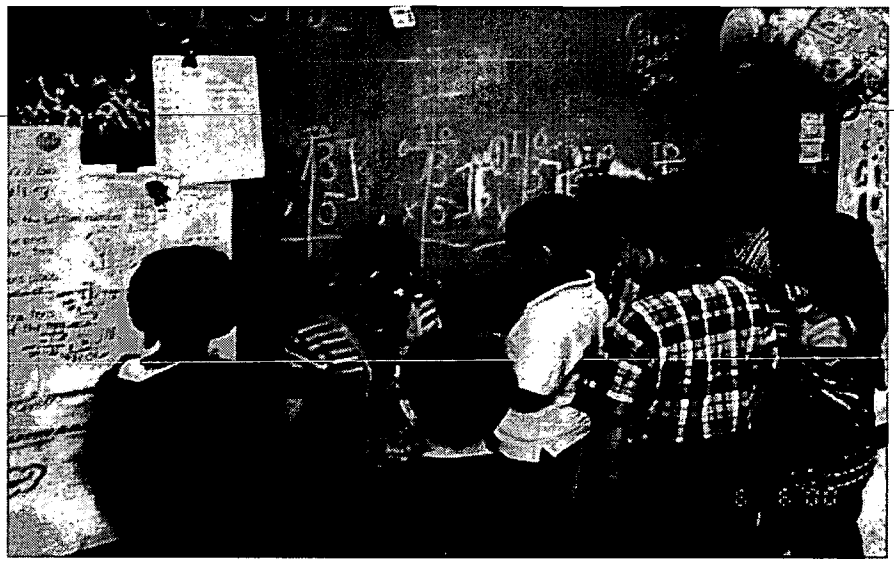
To determine the status of equity in the system, the auditors examined district documentation and interviewed administrators, staff, and parents. Site visits to a randomly selected group of Montgomery County Public Schools were also conducted. The auditors examined system equity in student achievement; promotion and retention; graduation and dropout rates; and student placement in special programs.

The following documents related to equity were examined:

Our Call to Action: The Citizens Budget FY 2001 acknowledges the need to respond to a major challenge facing Montgomery County Public Schools, a "school system (that) is rapidly changing, becoming more diverse...." One of four indices to assess performance of the district is that of equity: "How racial/ethnic groups in a school compare to each other on the academic proficiency ratios and the extent to which achievement gaps are closing."

The document also asserts that, "Improving the performance of every student is our single objective, the one outcome for which we in the school system must hold ourselves accountable." The importance of the equity index as a segment of the district's self-assessment process is stressed in this document.

The auditors found wide gaps among the achievement levels of the various populations, (i.e., African American, Hispanic, and White students). The apparent discrepancies in academic performance have prompted those in leadership positions to search for strategies intended to "Raise Bar, Close the Gap." Others question the district's ability to successfully respond to the challenges, indicating that low performance of some students is to be expected, particularly those eligible for Free and Reduced Meals Service (FARMS), or those belonging to certain racial/ethnic groups.



Oak View Elementary Math Lesson at the Chalkboard

Student Achievement: The primary tools for assessing student performance in Montgomery County are the Montgomery County Public Schools Criterion-referenced Test and the Maryland State Performance Assessment Program (MSPAP). The Scholastic Achievement Test (SAT), and Advanced Placement (AP) tests are those assessment tools that assess the performance of college-bound students. The Comprehensive Test of Basic Skills (CTBS) test was administered for the first time this school year, 1999-2000. No CTBS data were available for examination.

To determine the extent to which discrepancies in student performance existed among schools, the auditors examined several documents. The auditors used the following as data sources:

- *The Maryland School Performance Report, 1999;*
- 1999 CRT Results, Number Students Tested and Percentages Meeting Standard (Score 650 and Above), Elementary and Middle Schools;
- MCPS Schools At a Glance, 1999-2000, Elementary, Middle, and High Schools; and
- 1999 Maryland and State Department of Education: Report Card: Montgomery County, Elementary, Middle, and High Schools.

Analysis of the student performance data revealed discrepancies in student achievement when disaggregated by gender and by race. At several grade levels, serious discrepancies exist, particularly among African American, Hispanic, and White students. Because of the small percentages of Native American students, data for this group were not included.

The Montgomery County Public Schools Criterion-referenced Mathematics Test (CRT) is administered from grades three through eight. To achieve a level of proficiency on the mathematics portion of the CRT, a student must earn a score of 650. Disaggregated data are reported by grade level for all schools in the county. An examination of these data and Free And Reduced Meal Service (FARMS) data revealed that a strong negative relationship between the percentages of students eligible for FARMS and the overall school performance on the mathematics CRT exists. In other words, the greater the percentage of FARMS students in a school, the lower the overall performance of the school on the Montgomery County Public Schools Math CRT.

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Exhibit 2.1 lists those Montgomery County schools with less than 10 percent, and those with more than 40 percent of their population eligible for FARMS. For each of the schools, percentages of students meeting standard in grades three, four, and five are also listed.

Exhibit 2.1

Distribution of FARMS Students by Schools and Percent of Students Meeting Standard by Grade Level
Montgomery County Public Schools
1999-2000

Less than 10% FARMS					Greater than 40% FARMS				
School	3rd	4th	5th	Farms	School	3rd	4th	5th	Farms
Burning Tree	84	85	86	1.2	Strathmore	32	37	25	41.0
Carderock Springs	82	93	81	1.2	Whetstone	61	41	64	41.1
Darnestown	67	68	86	1.5	Greencastle	44	20	43	42.7
Wood Acres	83	89	90	1.6	Cresthaven	51	33	43	43.1
Lakewood	79	82	90	1.8	Twinbrook	38	13	46	43.3
Seven Locks	86	63	89	2.2	Rock View	40	37	21	43.4
Cold Spring	56	89	90	2.4	Glenallan	34	34	64	43.9
Bannockburn	83	91	93	2.5	South Lake	51	28	52	44.6
Westbrook	84	70	98	2.5	Georgian Forest	68	42	58	44.9
Wyngate	86	66	68	2.6	Maryvale	39	35	31	45.2
Beverly Farms	84	77	77	2.8	Brookhaven	21	27	24	45.5
Woodfield	66	69	68	3.2	Glen Haven	40	31	12	45.8
Dufief	90	79	97	3.5	Kemp Mill	51	36	45	46.6
Potomac	70	82	79	3.5	Jackson Road	48	58	46	47.7
Wayside	81	69	94	4.0	Highland View	68	49	35	48.6
Greenwood	70	67	67	4.2	Washington Grove	42	30	43	49.1
Jones Lane	83	85	77	4.7	Wheaton Woods	21	24	22	54.6
Bradley Hills	79	74	93	4.8	East Silver Spring	47	NA	NA	54.8
Somerset	81	77	89	5.2	Burnt Mills	38	25	30	55.7
Stonegate	60	73	34	5.5	Rosemont	68	66	57	56.4
Fallsmead	76	82	81	6.0	Weller Road	64	35	40	56.7
Cloverly	75	66	70	6.3	Viers Mill	27	30	39	59.4
Laytonsville	60	79	61	6.4	Pine Crest	30	55	44	60.8
Travilah	80	78	83	6.6	Summit Hall	36	71	42	62.6
Farmland	68	77	81	6.9	Highland	32	71	36	64.4
Poolesville ES	72	61	79	8.1	Rolling Terrace	55	44	49	69.3
Rockwell	52	73	60	8.2	Gaithersburg ES	45	40	42	72.4
Luxmanor	83	78	75	8.4	Harmony Hills	33	31	21	75.1
Cashell	75	78	80	9.0	Oak View	29	27	36	83.9
Monocacy	63	86	69	9.1	Broad Acres	31	21	35	90.8

NA = Not Applicable

Exhibit 2.1 presents the following conclusions concerning the relationship between the percentage of FARMS at the selected schools and the percentage of students meeting standard among third, fourth, and fifth graders:

- At the third grade level, in those schools with less than 10 percent of its population eligible for FARMS, the percentage of students meeting standard ranged from 52 percent (Rockwell) to 90 percent (Dufief).
- The range of third grade scores at the satisfactory level among schools with a percentage of FARMS students greater than 40 percent was from 21 percent (Brookhaven and Wheaton Woods) to 68 percent (Georgian Forest, Highland View, and Rosemont).

- At the fourth grade level, in those schools with less than 10 percent of its population eligible for FARM, the percentage of students meeting standard ranged from 61 percent (Poolesville) to 93 percent (Carderock).
- Among schools with a percentage of FARMS students greater than 40 percent, the range of fourth grade scores meeting the standard was from 13 (Twinbrook) percent to 71 percent (Highland and Summit Hall).
- At the fifth grade level, those schools with less than 10 percent of their population eligible for FARM, the percentage of students meeting standard ranged from 34 percent (Stonegate) to 98 percent (Westbrook). Stonegate was the only school in the group with less than 60 percent of its students meeting the standard (34 percent). The range of fifth grade scores at the satisfactory level among schools with a percentage of FARMS students greater than 40 percent was from 12 percent (Glen Haven) to 64 percent (Glenallan and Whetstone).

The auditors analyzed the data identifying the discrepancy between African American and White, and Hispanic and White students. Slightly more than one-fourth of the total number of elementary schools was selected displaying the greatest gap between the groups. Exhibit 2.2 to Exhibit 2.7 illustrate the discrepancies between African American and White, and Hispanic and White student performance in mathematics in grade three to grade eight. Consistently, African American and Hispanic students' performance is well below the standard. Both groups, in general, are outperformed by both White and Asian students at each grade level and in nearly all of the selected schools. Exhibit 2.2 presents those schools with the highest discrepancies between African American and White and Hispanic and White student performance in third grade mathematics.

Exhibit 2.2
Comparison of Percentage of White Grade 3 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 3						
Schools	*AA	*WH	Difference	Schools	*HIS	*WH	Difference
Ashburton	33	82	49	Ashburton	33	82	49
Beall	13	72	59	Barnsley	20	71	51
Bethesda	38	83	45	Belmont	50	87	37
Cashell	25	82	57	Chevy Chase	33	82	49
Cedar Grove	25	82	57	Drew	33	78	45
Diamond	18	65	47	East Silver Spring	25	76	51
Drew	28	78	50	Fallsmead	25	80	55
East Silver Spring	25	76	51	Fields Road	33	92	59
Fairland	16	65	49	Flower Valley	25	85	60
Fallsmead	33	80	47	Forest Knolls	30	71	41
Fields Road	14	92	78	Fox Chapel	33	86	53
Flower Hill	35	82	47	Gaithersburg ES	29	71	42
Glen Haven	30	75	45	Glen Haven	27	75	48
Greencastle	27	81	54	Goshen	33	84	51
Jackson Road	19	65	46	Greencastle	20	81	61
Lake Seneca	11	59	48	Highland View	43	84	41
Marshall	29	75	46	Jackson Road	20	65	45
Pine Crest	17	65	48	Marshall	25	75	50
Piney Branch	33	78	45	Maryvale	12	60	48
Poolesville ES	25	74	49	North Chevy Chase	33	87	54
Rachel Carson	25	70	45	Pine Crest	15	65	50

Exhibit 2.2 (continued)
Comparison of Percentage of White Grade 3 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 3						
Schools	*AA	*WH	Difference	Schools	*HIS	*WH	Difference
Resnik	26	76	50	Piney Branch	27	78	51
Rock Creek Valley	20	73	53	Rachel Carson	25	70	45
Rosemont	22	82	60	Rock Creek Forest	17	75	58
Somerset	33	85	52	Rock Creek Valley	29	73	44
Stone Mill	25	73	48	Rock View	18	59	41
Travilah	33	80	47	Rosemont	38	82	44
Wayside	33	84	51	Strawberry Knoll	14	56	42
Woodlin	20	76	56	Summit Hall	29	67	38

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.2 reveals the following:

- The percentage of African American students meeting standard ranged from a low of 11 (Lake Seneca) to a high of 38 percent (Bethesda).
- In contrast to African American student performance, the percentage of White students meeting standard ranged from 59 percent (Lake Seneca) to 92 percent (Fields Road).
- The poorest performance among African American students occurred at Lake Seneca (11 percent); Rosemont and Beall (13 percent); and Fields Road (14 percent).
- The gap between African American and White students was greatest (78 percent) at Fields Road, where 14 percent of the African American students met the standard compared to 92 percent of the White students.
- The percentage of Hispanic students meeting standard ranged from 12 percent (Maryvale) to 50 percent (Belmont).
- In comparison with Hispanic students, the percentage of White students meeting standard ranged from 56 percent (Strawberry Knoll) to 92 percent (Fields Road).
- The poorest performance among Hispanic students occurred at Maryvale (12 percent), Strawberry Knoll (14 percent), and Pine Crest (15 percent).
- The gap between Hispanic and White students was greatest (61 percent) at Greencastle where 20 percent of the Hispanics met the standard, compared to 81 percent of White students meeting the standard.

Exhibit 2.3
Comparison of Percentage of White Grade 4 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 4						
Schools	*AA	*WH	Difference	Schools	*HIS	*WH	Difference
Barnsley	37	96	59	Barnsley	40	96	56
Beall	23	84	61	Belmont	50	84	34
Brown Station	13	58	45	Brook Haven	17	53	36
Burnt Mills	18	83	65	Brown Station	14	58	44
Cedar Grove	29	81	52	Burning Tree	50	85	35
Chevy Chase	31	80	49	Burnt Mills	24	83	59

Exhibit 2.3 (continued)
Comparison of Percentage of White Grade 4 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 4						
Schools	*AA	*WH	Difference	Schools	*HIS	*WH	Difference
College Gardens	27	73	46	Clopper Mill	20	58	38
Cresthaven	15	77	62	Cresthaven	33	77	44
Drew	35	80	45	Diamond	17	57	40
Flower Valley	25	86	61	Fairland	33	66	33
Georgian Forest	14	71	57	Fields Road	33	77	44
Glen Haven	10	56	46	Flower Hill	6	46	40
Highland	42	90	48	Forest Knolls	28	71	43
Jackson Road	28	79	51	Fox Chapel	22	76	54
Kemp Mill	22	67	45	Gaithersburg ES	16	60	44
Laytonsville	38	85	47	Germantown	17	76	59
Maryvale	8	59	51	Highland View	25	94	69
Olney	11	62	51	Kemp Mill	12	67	55
Page	5	50	45	Kensington-Parkwood	25	66	41
Piney Branch	14	70	56	Maryvale	11	59	48
Rock Creek Forest	30	88	58	Meadow Hall	18	52	34
Rock View	8	59	51	Olney	25	62	37
Rolling Terrace	27	89	62	Pine Crest	35	81	46
Sequoyah	21	84	63	Piney Branch	19	70	51
Sherwood ES	25	86	61	Rachel Carson	22	60	38
Stonegate	36	83	47	Rolling Terrace	28	89	61
Watkins Mill ES	16	61	45	Southlake	10	58	48
Wayside	20	67	47	Washington Grove	18	63	45
Weller Road	12	65	53	Weller Road	24	65	41
Whetstone	20	70	50	Whetstone	20	70	50

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.3 reveals the following concerning grade four students:

- The percentage of African American students meeting standard ranged from five percent (Page) to a high of 38 percent (Laytonsville).
- In comparison with African American students, the percentage of White students meeting standard ranged from 50 percent (Kemp Mill) to 96 percent (Barnsley).
- The poorest performance among African American students occurred at Page (five percent), Rock View (eight percent), and Maryvale (eight percent).
- Schools with the greatest discrepancy between African American and White students included Burnt Mills (65 percent), Sequoyah (63 percent), Cresthaven and Rolling Terrace (62 percent), and Beall, Flower Valley, and Sherwood (61 percent).
- The percentage of Hispanic students meeting standard ranged from six percent (Flower Hill) and 50 percent (Burning Tree and Belmont).
- In comparison with Hispanic students, the percentage of White students meeting standard ranged from 46 percent (Flower Hill) to 96 percent (Barnsley).
- The poorest performance among Hispanic students occurred at Flower Hill (six percent), Southlake (10 percent), and Maryvale (11 percent).
- Schools with the greatest discrepancies between Hispanic and White students were Highland View (69 percent) and Rolling Terrace (61 percent).

Exhibit 2.4
Comparison of Percentage of White Grade 5 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 5						
Schools	*AA	*WH	Difference	Schools	*HIS	*WH	Difference
Barnsley	38	89	51	Ashburton	25	74	49
Brooke Grove	31	80	49	Barnsley	44	89	45
Candlewood	17	72	55	Bethesda	10	87	77
Chevy Chase	33	92	59	Brown Station	14	50	36
College Gardens	33	87	54	Burnt Mills	6	57	51
Cresthaven	19	81	62	Burtonsville	17	63	46
Diamond	22	81	59	Cresthaven	6	81	75
Drew	43	91	48	Drew	43	91	48
Fairland	26	74	48	Forest Knolls	38	81	43
Farmland	40	88	48	Georgian Forest	40	90	50
Flower Valley	33	81	48	Glenallan	58	93	35
Forest Knolls	24	81	57	Goshen	44	91	47
Gaithersburg ES	13	60	47	Highland	16	50	34
Galway	31	78	47	Jackson Road	20	72	52
Garrett Park	25	86	61	Kemp Mill	14	84	70
Georgian Forest	20	90	70	Maryvale	13	47	34
Germantown	29	79	50	North Chevy Chase	33	80	47
Glenallan	36	93	57	Oak View	31	86	55
Goshen	31	91	60	Oakland Terrace	15	63	48
Jackson Road	20	72	52	Olney	40	84	44
Kemp Mill	9	84	75	Page	33	78	45
Kensington-Parkwood	43	89	46	Piney Branch	21	75	54
Lake Seneca	17	71	54	Ritchie Park	25	65	40
North Chevy Chase	9	80	71	Rock Creek Valley	14	64	50
Oak View	22	86	64	Rolling Terrace	37	93	56
Olney	22	84	62	Sequoyah	21	66	45
Page	32	78	46	Washington Grove	11	64	53
Piney Branch	19	75	56	Waters Landing	25	63	38
Rachel Carson	11	57	46	Wayside	50	93	43
Rolling Terrace	43	93	50	Whetstone	45	85	40
Stone Mill	25	84	59	Woodlin	27	79	52

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.4 illustrates the following concerning grade five students:

- The percentage of African American students meeting standard ranged from nine percent (Kemp Mill and North Chevy Chase) to 43 percent (Drew, Rolling Terrace, and Kensington-Parkwood).
- In comparison with African American students, the percentage of White students meeting standard ranged from 57 percent (Rachel Carson) to 93 percent (Rolling Terrace and Glenallan).
- The poorest performance among African American students occurred at Kemp Mill and North Chevy Chase (nine percent) and Rachel Carson (11 percent).
- The schools with the greatest discrepancy between the African American and White students were Kemp Mill (75 percent), North Chevy Chase (71 percent), and Georgian Forest (70 percent).

- The percentage of Hispanic students meeting standard ranged from six percent (Cresthavan and Burnt Mills) to 58 percent (Glenallan).
- The percentage of White students meeting standard ranged from 47 percent (Maryvale) to 93 percent (Glenallan, Rolling Terrace, and Wayside).
- The poorest performance among Hispanic students occurred at Cresthaven and Burnt Mills (six percent), Bethesda (10 percent), and Washington Grove (11 percent).
- Schools with the greatest discrepancy between Hispanic and White students were Bethesda (77 percent), Cresthaven (75 percent), and Kemp Mill (70 percent).

Exhibit 2.5
Comparison of Percentage of White Grade 6 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 6						
School	***AA**	***WH**	**Difference**	**School**	***HIS**	***WH**	**Difference**
King MS	30	64	34	Argyle MS	4	35	31
Tilden MS	21	81	60	Baker MS	0	64	64
Pyle MS	67	86	19	Banneker MS	64	66	2
Baker MS	23	64	41	Briggs Chaney MS	33	69	36
Argyle MS	20	35	15	Cabin John MS	86	88	2
John Poole MS	40	61	21	Clemente MS	29	43	14
Redland MS	15	67	52	Eastern MS	24	75	51
Kingsview MS	20	70	50	Farquhar MS	32	80	48
Neelsville MS	36	70	34	Forest Oak MS	41	71	30
Parkland MS	17	36	19	Frost MS	80	85	5
Montgomery Village MS	22	53	31	Gaithersburg MS	23	50	27
Gaithersburg MS	17	50	33	Hoover MS	60	89	29
Frost MS	33	85	52	John Poole MS	0	61	61
Forest Oak MS	23	71	48	Julius West MS	32	73	41
Banneker MS	18	66	48	Key MS	18	59	41
Rocky Hill MS	33	57	24	King MS	42	64	22
Briggs Chaney MS	34	69	35	Kingsview MS	38	70	32
Cabin John MS	36	88	52	Lee MS	24	85	61
Farquhar MS	55	80	25	Montgomery Village MS	29	53	24
Sligo MS	15	49	34	Neelsville MS	40	70	30
Hoover MS	67	89	22	Parkland MS	21	36	15
Julius West MS	23	73	50	Pyle MS	43	86	43
White Oak MS	28	77	49	Redland MS	24	67	43
Eastern MS	38	75	37	Ridgeview MS	21	56	35
Rosa Parks MS	32	77	45	Rocky Hill MS	20	57	37
Clemente MS	13	43	30	Rosa Parks MS	50	77	27
Ridgeview MS	9	56	47	Sligo MS	10	49	39
Takoma Park MS	19	81	62	Takoma Park MS	8	81	73
Lee MS	35	85	50	Tilden MS	35	81	46
Wood MS	8	56	48	Westland MS	35	75	40
Westland MS	19	75	56	White Oak MS	15	77	62
Key MS	13	59	46	Wood MS	18	56	38

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.5 illustrates the following concerning grade six middle school students:

- The percentage of African American students meeting standard ranged from eight percent (Wood) to 67 percent (Hoover and Pyle).
- In comparison with African American students, the percentage of White students meeting standard ranged from 35 percent (Argyle) to 89 percent (Hoover).
- The poorest performance among African American students occurred at Wood (eight percent), Ridgeview (nine percent), and Key and Clemente (13 percent).
- The schools with the greatest discrepancy between African American and White students were Takoma Park (62 percent) and Tilden (60 percent).
- The percentage of Hispanic students meeting standard ranged from four percent (Argyle) to 86 percent (Cabin John).
- Schools with the greatest discrepancy between Hispanic and White students included Takoma Park (73 percent), White Oak (62 percent), and Lee (61 percent).

Exhibit 2.6 illustrates the following concerning grade seven students:

Exhibit 2.6
Comparison of Percentage of White Grade 7 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 7						
School	***AA**	***WH**	**Difference**	**School**	***HIS**	***WH**	**Difference**
Cabin John MS	23	88	65	Takoma Park MS	15	89	74
Takoma Park MS	25	89	64	Eastern MS	17	81	64
Eastern MS	18	81	63	Briggs Chaney MS	20	73	53
Key MS	16	75	59	Westland MS	37	89	52
Westland MS	34	89	55	Key MS	24	75	51
Redland MS	22	75	53	White Oak MS	36	83	47
Wood MS	21	71	50	Wood MS	25	71	46
Ridgeview MS	24	72	48	Montgomery Village MS	7	50	43
Julius West MS	34	82	48	Forest Oak MS	23	65	42
Clemente MS	12	58	46	Sligo MS	18	60	42
Kingsview MS	7	53	46	Lee MS	29	69	40
Frost MS	44	89	45	Redland MS	35	75	40
Forest Oak MS	22	65	43	Ridgeview MS	39	72	33
Montgomery Village MS	7	50	43	Argyle MS	24	56	32
White Oak MS	41	83	42	Neelsville MS	31	62	31
King MS	23	64	41	Rocky Hill MS	20	51	31
Briggs Chaney MS	34	73	39	Julius West MS	52	82	30
Rosa Parks MS	22	61	39	Farquhar MS	40	69	29
Tilden MS	37	76	39	Pyle MS	64	93	29
Neelsville MS	24	62	38	Rosa Parks MS	32	61	29
Farquhar MS	32	69	37	Banneker MS	55	79	24
Banneker MS	46	79	33	Kingsview MS	29	53	24
Argyle MS	24	56	32	Parkland MS	17	41	24
Sligo MS	28	60	32	Tilden MS	52	76	24
Hoover MS	57	88	31	Frost MS	67	89	22
Lee MS	38	69	31	Clemente MS	38	58	20
Pyle MS	62	93	31	Gaithersburg MS	28	45	17
Rocky Hill MS	20	51	31	Baker MS	60	71	11

Exhibit 2.6 (continued)
Comparison of Percentage of White Grade 7 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 7						
School	*AA	*WH	Difference	School	*HIS	*WH	Difference
Gaithersburg MS	21	45	24	King MS	56	64	8
Parkland MS	24	41	17	Hoover MS	82	88	6
John Poole MS	67	71	4	Cabin John MS	83	88	5

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.5 illustrates the following concerning grade seven students:

- The percentage of African American students meeting standard ranged from seven percent (Kingsview and Montgomery Village) to 67 percent (John Poole).
- In comparison with African American students, the percentage of White students meeting standard ranged from 41 percent (Parkland) to 93 percent (Pyle).
- The poorest performance among African American students occurred at Kingview and Montgomery Village (seven percent).
- Schools with the greatest discrepancy between African American and White students were Cabin John (65 percent), Takoma Park (64 percent), and Eastern (63 percent).
- The percentage of Hispanic students meeting standard ranged from seven percent (Montgomery Village) to 83 percent (Cabin John).
- In comparison with Hispanic students, the percentage of White students meeting standard ranged from 41 percent (Parkland) to 93 percent (Pyle).
- Schools with the greatest discrepancy between Hispanic and White students included Takoma Park (74 percent) and Eastern (64 percent).

Exhibit 2.7
Comparison of Percentage of White Grade 8 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 8						
School	*AA	*WH	Difference	School	*HIS	*WH	Difference
Argyle MS	24	50	26	Parkland MS	24	38	14
Baker MS	20	64	44	King MS	23	59	36
Banneker MS	24	53	29	Banneker MS	27	53	26
Briggs Chaney MS	32	60	28	Rosa Parks MS	36	62	26
Cabin John MS	41	80	39	Briggs Chaney MS	26	60	34
Clemente MS	20	35	15	Rocky Hill MS	33	41	8
Eastern MS	26	77	51	Ridgeview MS	15	64	49
Farquhar MS	58	71	13	Pyle MS	80	87	7
Forest Oak MS	29	71	42	Sligo MS	22	57	35
Frost MS	75	83	8	Farquhar MS	67	71	4
Gaithersburg MS	20	53	33	Key MS	27	57	30
Hoover MS	100	92	-8	Hoover MS	93	92	-1
John Poole MS	100	44	-56	John Poole MS	60	44	-16
Julius West MS	27	75	48	Forest Oak MS	29	71	42
Key MS	25	57	32	Argyle MS	22	50	28

Exhibit 2.7 (continued)
Comparison of Percentage of White Grade 8 Students Meeting Standard
on Mathematics CRT with African American and Hispanic Students
Montgomery County Public Schools
1998-1999

	Grade 8						
School	***AA**	***WH**	**Difference**	**School**	***HIS**	***WH**	**Difference**
King MS	29	59	30	Lee MS	52	79	27
Kingsview MS	13	44	31	Kingsview MS	17	44	27
Lee MS	29	79	50	Tilden MS	38	85	47
Montgomery Village MS	6	54	48	Westland MS	34	79	45
Neelsville MS	33	61	28	Redland MS	55	70	15
Parkland MS	18	38	20	Clemente MS	24	35	11
Pyle MS	33	87	54	Takoma Park MS	12	79	67
Redland MS	44	70	26	Cabin John MS	67	80	13
Ridgeview MS	16	64	48	White Oak MS	29	72	43
Rocky Hill MS	13	41	28	Baker MS	50	64	14
Rosa Parks MS	25	62	37	Montgomery Village MS	20	54	34
Sligo MS	13	57	44	Gaithersburg MS	18	53	35
Takoma Park MS	28	79	51	Julius West MS	26	75	49
Tilden MS	53	85	32	Neelsville MS	33	61	28
Westland MS	26	79	53	Eastern MS	27	77	50
White Oak MS	38	72	34	Wood MS	27	61	34
Wood MS	35	61	26	Frost MS	71	83	12

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.7 reveals the following about grade eight students:

- The percentage of African American students meeting standard ranged from six percent (Montgomery Village) to 100 percent (Hoover and John Poole).
- In comparison with African American students, the percentage of White students meeting standard ranged from 35 percent (Clemente) to 92 percent (Hoover).
- Schools with the greatest discrepancy between African American and White students included Pyle (54 percent), Westland (53 percent), and Eastern (51 percent).
- The percentage of Hispanic students meeting standard ranged from 12 percent (Takoma Lake) to 93 percent (Hoover).
- In comparison with Hispanic students, the percentage of White students meeting standard ranged from 35 percent (Clemente) to 92 percent (Hoover).
- Schools with the greatest discrepancy between Hispanic and White students were Takoma Park (67 percent), Eastern (50 percent), and Julius West and Ridgeview (49 percent).

In some instances, data indicated that no African American students in grades three, four, and five met standard. Similarly, data indicated that in some schools no grade four or five Hispanic students met the standard. Those schools where African American students were tested but their performance was below the satisfactory level are listed in Exhibit 2.8. Exhibit 2.9 includes those schools where Hispanic students were tested but did not meet standard. The percentage of White students meeting standard are also presented in Exhibit 2.8, and Exhibit 2.9 represents the discrepancy between African American and White, and Hispanic and White student performances.

Exhibit 2.8
Schools with No African American Students Meeting Standard
and Percentages of White Students Meeting Standard
Montgomery County Public Schools

Schools with No African Americans Meeting Standard	Grade 3 Number of African Americans Students Tested	Percentage of African American Students Meeting Standard	Percentage of White Students Meeting Standard
Barnsley	6	0%	71
Candlewood	7	0%	57
Clarksburg	3	0%	53
Laytonsville	6	0%	63
Meadow Hall	5	0%	40
Twinbrook	8	0%	42
Schools with No African Americans Meeting Standard	**Grade 4** **Number of African Americans Students Tested**	**Percentage of African American Students Meeting Standard**	**Percentage of White Students Meeting Standard**
Candlewood	6	0%	80
Clearspring	7	0%	44
Highland View	7	0%	94
Kensington-Parkwood	8	0%	66
Meadow Hall	12	0%	52
Resnik	17	0%	52
Southlake	17	0%	58
Stedwick	23	0%	36
Twinbrook	8	0%	19
Washington Grove	10	0%	63
Schools with No African Americans Meeting Standard	**Grade 5** **Number of African Americans Students Tested**	**Percentage of African American Students Meeting Standard**	**Percentage of White Students Meeting Standard**
Fields Road	5	0%	44
Highland View	8	0%	100
Woodfield	9	0%	75

Exhibit 2.8 reveals the following:

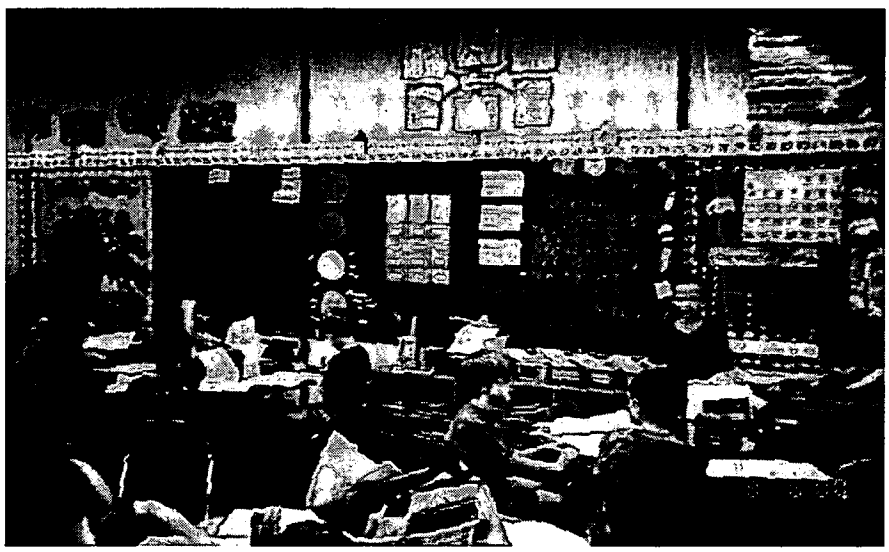
- In Twinbrook, of the eight third grade African American students tested, none met the standard, followed by Candlewood with seven African American students' performance failing to meet the standard.
- The discrepancy between African American and White students ranged between 71 percent and 42 percent.
- At the fourth grade, 23 African American students at Stedwick were tested, none of which met the standard.
- Similarly, none of the 17 fourth grade African American students at Resnik and Southlake met the standard.
- The discrepancy between African American and White 4th grade students ranged between 94 percent (Highland View) and 19 percent (Twinbrook).

Exhibit 2.9
Schools with No Hispanic Students Meeting Standard
and Percentages of White Students Meeting Standard
Montgomery County Public Schools

Schools with No Hispanic Students Meeting Standard	Grade 4		
	Number of Hispanic Students Tested	Percentage of Hispanic Students Meeting Standard	Percentage of White Students Meeting Standard
Bethesda	8	0%	75
Cannon Road	6	0%	54
Chevy Chase	8	0%	80
Galway	5	0%	66
Mill Creek Towne	6	0%	52
Sally K. Ride	6	0%	44
Sequoyah	7	0%	84
Waters Landing	5	0%	63
Schools with No Hispanic Students Meeting Standard	**Grade 5**		
	Number of Hispanic Students Tested	**Percentage of Hispanic Students Meeting Standard**	**Percentage of White Students Meeting Standard**
Marshall	5	0%	54
Rachel Carson	11	0%	57
Watkins Mill ES	6	0%	58

Exhibit 2.9 reveals the following:

- In Bethesda and Chevy Chase, eight of the fourth grade Hispanic students who were tested failed to meet standard, followed by seven in Sequoyah.
- The discrepancy between Hispanic and White students ranged between 52 percent (Mill Creek Towne) to 84 percent (Sequoyah).
- At the fifth grade level, 11 Hispanic students who were tested at Rachel Carson did not meet standard.
- The discrepancy between Hispanic and White students was 54 percent (Marshall), 57 percent (Rachel Carson), and 58 percent (Watkins Mill).



Takoma Park Elementary Math Class in Action

The Maryland State Performance Assessment Program requires grades 3, 5, and 8 to apply what they know about reading, writing, language usage, mathematics, science, and social studies. Reports for the district provide data that reflect the percentage of students achieving a satisfactory score and those meeting the excellent standard. To achieve a satisfactory score, 70 percent of the students must meet the state standard. An excellent rating is granted when 70 percent or more students achieve satisfactory or above, and 25 percent or more students achieve the excellent level.

An examination of Maryland State Performance Assessment Program (MSPAP) data reveals that between two ethnic minority groups (African American and Hispanic) and White students discrepancies persist from 1995 to 1999. From year to year, greater percentages of White students achieve both satisfactory and excellent status. Exhibit 2.10, Exhibit 2.11, Exhibit 2.12, Exhibit 2.13, Exhibit 2.14, and Exhibit 2.15 indicate that in some of the grade levels, percentages fluctuate. More importantly, White students consistently outperformed African American and Hispanic students in each of the five years.

Exhibit 2.10
Percentage of Students Performing at the Satisfactory Standard by Ethnicity
Grade 3 MSPAP Mathematics
Montgomery County Public Schools
1995 - 1999

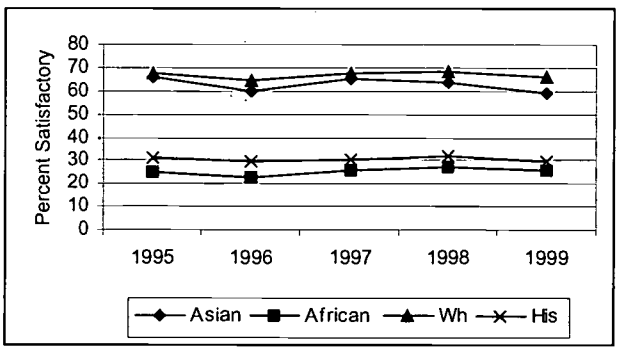


Exhibit 2.10 reveals the following concerning third grade students:

- Among all groups, the percentage of third graders meeting the satisfactory standard fluctuated from 1995 to 1999.
- In each year, the lowest performing groups were African American and Hispanic.
- In 1999, 26 percent of the African American group met the satisfactory standard; 29.6 percent of Hispanics met the satisfactory standard.
- The highest performing group, White third graders, exceeded the African American students by 39.7 percentage points.
- The spread between Hispanic and White students was 36.1 percent.

Exhibit 2.11
Percentage of Students Performing at the Excellent Standard by Ethnicity
Grade 3 MSPAP Mathematics
Montgomery County Public Schools
1995 – 1999

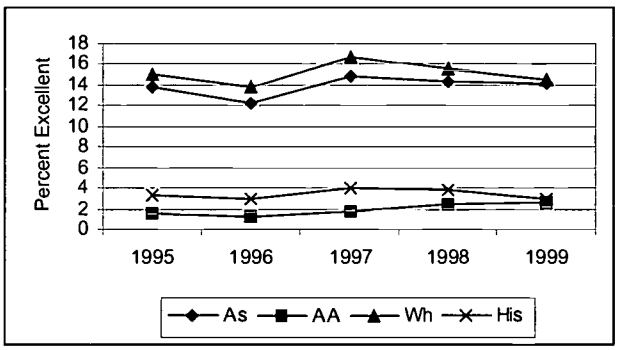


Exhibit 2.11 reveals that among grade three students:

- Slight variations within each group occurred from 1995 to 1999.
- A peak year for all students except African American students was 1997.
- From 1997 to 1999, the African American group was the only one with an increased percentage of students meeting the excellent standard.
- In 1999, the groups with lowest percentages meeting the excellent standard were African American (2.7 percent) and Hispanic (2.9 percent).
- The highest percentages of students earning an excellent rating in performance were Asian (14.1 percent) and White (14.5 percent).

Exhibit 2.12
Percentage of Students Performing at the Satisfactory Standard by Ethnicity
Grade 5 MSPAP Mathematics
Montgomery County Public Schools
1995 – 1999

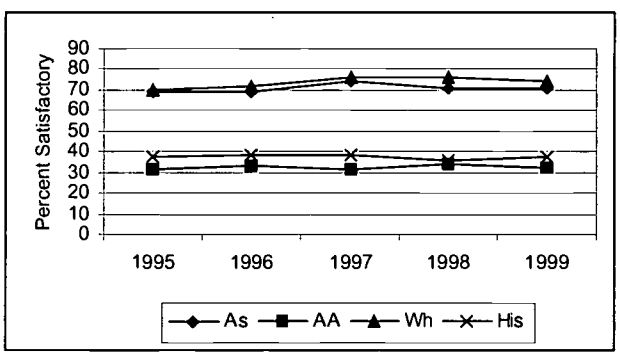


Exhibit 2.12 reveals the following concerning grade 5 performance:

- Among all groups the percentage of those in the satisfactory category, small differences were apparent from one year to the next.

- From 1995 to 1999, a slight increase occurred among all ethnic groups with the exception of Hispanic students, who declined from 37.8 percent in 1995 to 37.5 percent, achieving the satisfactory level in 1999.
- From 1995 to 1999, the percentage of White students in the satisfactory category increased by five percentage points.
- The lowest performing group in 1999 was African American (32.6 percent), 42 percent lower than White students, of whom 74.6 percent met the satisfactory standard.
- The spread between Hispanic and White students was 37.1 percentage points.

Exhibit 2.13
Percentage of Students Performing at the Excellent Standard by Ethnicity
Grade 5 MSPAP Mathematics
Montgomery County Public Schools
1995 – 1999

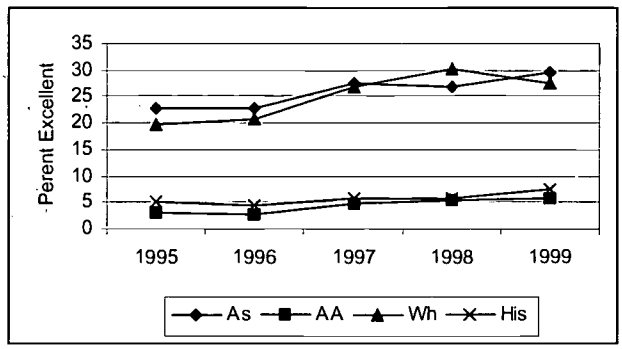


Exhibit 2.13 reveals the following concerning grade 5 students:

- In 1999, the percentage of students within the excellent category exceeded that of 1995.
- The greatest increase occurred within the White group, from 19.6 percent in 1995 to 27.6 percent in 1999.
- African American students (5.9 percent) within the excellent category, when compared to White students, were 21.7 percentage points lower than White students.
- Between White students (27.6 percent) and Hispanic students (7.5 percent), the discrepancy was 20.1 percentage points.

Exhibit 2.14
Percentage of Students Performing at the Satisfactory Standard by Ethnicity
Grade 8 Mathematics
Montgomery County Public Schools
1995 – 1999

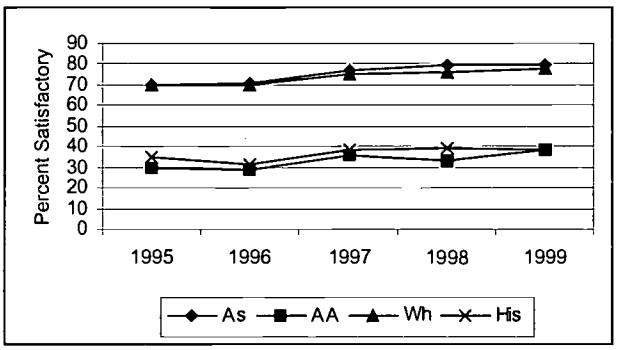


Exhibit 2.14 reveals the following about grade 8 students:

- The percentage of students meeting the satisfactory standard among African American and Hispanic students fluctuated from 1995 to 1999.
- In 1999, the groups with smallest percentage of students meeting the satisfactory standard were African American (38.6 percent) and Hispanic (38.5 percent).
- The greatest increase was among Asian students (9.8 percent), followed by African American students (8.7 percent) in 1999.
- The smallest increase of those meeting the satisfactory standard occurred among Hispanic students (3.8 percent).
- The percentage of white students meeting a satisfactory standard increased by 8.3 percent.
- The greatest spread (39.4 percent) was between White and African American students within the satisfactory category.

Exhibit 2.15
Percentage of Students Performing at the Excellent Standard by Ethnicity
Grade 8 Mathematics
Montgomery County Public Schools
1995 – 1999

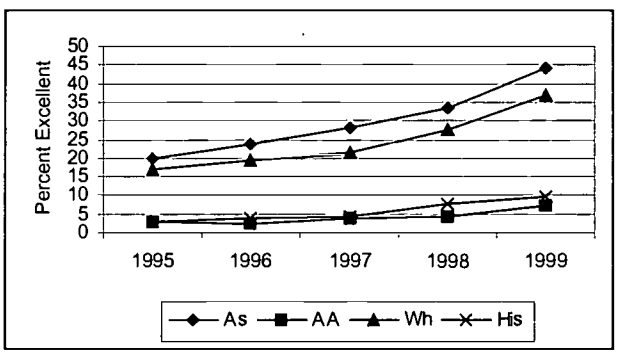


Exhibit 2.15 reveals the following about grade 8 students:

- The percentages of each group meeting the excellent standard increased from 1995 to 1999.
- The greatest increase occurred among Asian students (24.6 percent), followed by an increase among White students (19.1 percent).
- The smallest increases from 1995 to 1999 occurred among African American students (3.5 percent) and Hispanic students (6.8 percent).
- The group of students with the smallest percentage achieving excellent status was African American (7.3 percent), followed by Hispanic (9.8 percent); compare their percentages to Asian (44.3 percent) and White students (36.7 percent).

In comparing the percentage of male and female students achieving the satisfactory level in 1999, the auditors noted some variations between groups. Exhibit 2.16 and Exhibit 2.17 illustrates the variations between male and female students.

Exhibit 2.16
Percentages of Students Meeting the Satisfactory Standard by Gender
Grades 3, 5, and 8 - MSPAP
Montgomery County Public Schools
1999

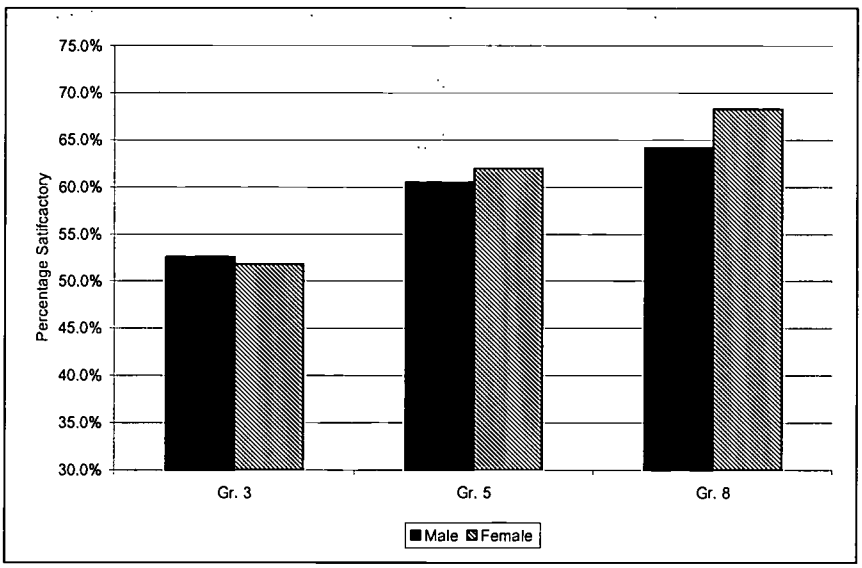


Exhibit 2.16 reveals the following:

- Third grade male students meeting the satisfactory standard exceeded females by less than one percentage point.
- By grade 5, females exceeded males by 1.5 percentage points.
- Females in grade eight exceeded males by 2.1 percentage points.

Exhibit 2.17
Percentages of Students Meeting the Excellent Standard by Gender
Grades 3, 5, and 8 MSPAP Mathematics
Montgomery County Public Schools
1999

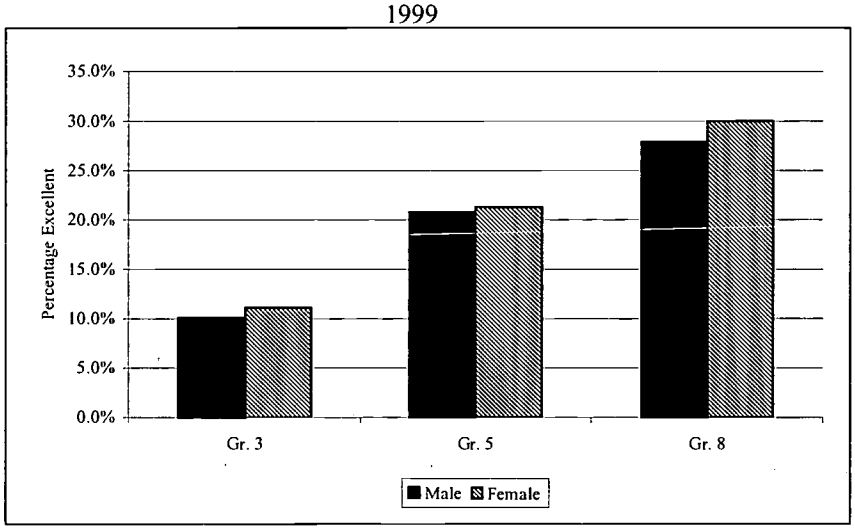


Exhibit 2.17 reveals the following:

- Females at all three grade levels exceeded males.
- Among grade 8 students, females exceeded males by 2.1 percentage points.

An analysis of student performance on MSPAP mathematics by individual schools indicated that the discrepancies existing between the performance of Whites and the two ethnic minority groups vary. In almost all of the schools, White students outperformed both African American and Hispanic students. To illustrate the existing discrepancies, schools with the greatest spread between White students and the two ethnic minority groups were selected. Schools listed in Exhibit 2.18, Exhibit 2.19, and Exhibit 2.20 represent approximately one-third of all the elementary schools. In each of the exhibits, the percentages of African American and Hispanic students meeting the satisfactory standard are less than those of White students.

Exhibit 2.18
Distribution of Percentages of Students by Schools
Meeting the Satisfactory Standard in Mathematics Grade 3 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 3						
School	AA	WH	Difference	School	HIS	WH	Difference
Beall	24.0	67.6	43.6	Barnsley	33.3	64.4	31.1
Bells Mill	28.6	77.3	48.7	Beall	33.3	67.6	34.3
Bethesda	11.1	86.3	75.2	Bethesda	20.0	86.3	66.3
Candlewood	10.0	58.3	48.3	Burtonsville	12.5	49.2	36.7
Cannon Road	19.4	73.9	54.5	Cannon Road	28.6	73.9	45.3
Chevy Chase	42.9	84.9	42.0	Diamond	12.5	59.5	47.0
Cloverly	20.0	64.4	44.4	East Silver Spring	33.3	65.7	32.4
Diamond	16.7	59.5	42.8	Fairland	12.5	52.9	40.4
Drew	25.0	70.8	45.8	Forest Knolls	18.2	60.0	41.8

Exhibit 2.18 (continued)
Distribution of Percentages of Students by Schools
Meeting the Satisfactory Standard in Mathematics Grade 3 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 3						
School	AA	WH	Difference	School	HIS	WH	Difference
East Silver Spring	15.2	65.7	50.5	Gaithersburg ES	17.6	61.1	43.5
Flower Valley	16.7	70.5	53.8	Georgian Forest	40.0	85.0	45.0
Gaithersburg ES	12.5	61.1	48.6	Greencastle	0.0	60.0	60.0
Georgian Forest	31.3	85.0	53.7	Highland View	18.8	75.9	57.1
Goshen	33.3	82.8	49.5	Jackson Road	0.0	46.9	46.9
Lake Seneca	26.1	70.5	44.4	Kemp Mill	25.0	56.5	31.5
Laytonsville	12.5	68.3	55.8	Lake Seneca	40.0	70.5	30.5
Marshall	18.2	81.8	63.6	Meadow Hall	6.7	42.2	35.5
Maryvale	11.5	52.5	41.0	Mill Creek Towne	15.4	55.9	40.5
North Chevy Chase	41.7	83.3	41.6	North Chevy Chase	28.6	83.3	54.7
Pine Crest	6.8	50.0	43.2	Oakland Terrace	19.0	56.3	37.3
Piney Branch	12.5	61.5	49.0	Pine Crest	15.4	50.0	34.6
Rachael Carson	17.4	74.6	57.2	Piney Branch	25.0	61.5	36.5
Rock Creek Forest	22.2	64.3	42.1	Rock Creek Forest	8.7	64.3	55.6
Rock Creek Valley	25.0	65.6	40.6	Rock View	26.3	70.0	43.7
Rolling Terrace	29.7	72.7	43.0	Rolling Terrace	39.0	72.7	33.7
Sequoyah	30.4	71.7	41.3	Rosemont	12.5	78.9	66.4
Stone Mill	20.0	62.1	42.1	Sequoyah	20.0	71.7	51.7
Travilah	33.3	82.7	49.4	South Lake	20.0	50.0	30.0
Washington Grove	13.3	70.0	56.7	Strawberry Knoll	0.0	35.1	35.1
Westover	0.0	43.3	43.3	Summit Hall	8.1	46.7	38.6
-	-	-	-	Washington Grove	27.3	70.0	42.7

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.19 reveals the following about grade 3 students:

- The percentage of African American students meeting the satisfactory standard ranged from none (Westover) to a high of 42.9 percent (Chevy Chase).
- In comparison with African American students, the percentage of White students meeting the satisfactory standard ranged from 43.3 percent (Westover) to 86.3 percent (Bethesda).
- The poorest performance among African American students occurred at Westover (none), Pinecrest (6.8 percent), Bethesda (11.1 percent), and Maryvale (11.5 percent).
- Schools with the greatest discrepancy between African American and White students included Bethesda (75.2 percent) and Marshall (63.6 percent).
- The percentage of Hispanic students meeting the standard ranged from none (Greencastle, Jackson Road, and Strawberry Knoll) to 40 percent (Georgian Forest and Lake Seneca).
- In comparison to Hispanic students, the percentage of White students meeting the standard ranged from 35.1 percent (Strawberry Knoll) to 86.3 percent (Bethesda).
- Aside from Greencastle, Jackson Road, and Strawberry Knoll, Meadow Hall (6.7 percent), Summit Hall (8.1 percent), and Rock Creek Forest (8.7 percent) reported the lowest percentages of students meeting standard.
- Schools with the greatest discrepancies between Hispanic and White students included Rosemont (66.4 percent) and Bethesda (66.3 percent).

Exhibit 2.19
Distribution of Percentages of Students in Schools
Meeting the Satisfactory Standard in Mathematics Grade 5 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 5						
School	AA	WH	Difference	School	HIS	Wh	Difference
Barnsley	31.3	81.5	50.2	Barnsley	22.2	81.5	59.3
Beall	24.0	84.6	60.6	Beall	45.5	84.6	39.1
Bells Mill	50.0	92.5	42.5	Bethesda	14.3	88.7	74.4
Bethesda	0.0	88.7	88.7	Bradley Hills	40.0	77.0	37.0
Burnt Mills	17.4	64.7	47.3	Brookhaven	12.5	47.8	35.3
Candlewood	33.3	74.6	41.3	Brown Station	10.0	50.0	40.0
Chevy Chase	36.4	91.4	55.0	Burnt Mills	22.2	64.7	42.5
Clearspring	16.7	61.3	44.6	Cannon Road	25.0	60.9	35.9
College Gardens	20.0	90.2	70.2	Chevy Chase	42.9	91.4	48.5
Cresthaven	30.3	75.9	45.6	Cresthaven	21.1	75.9	54.8
Diamond	33.3	74.5	41.2	Drew	42.9	83.3	40.4
Drew	30.0	83.3	53.3	Fallsmead	20.0	73.8	53.8
Fairland	28.9	74.2	45.3	Flower Hill	27.8	76.7	48.9
Farmland	40.0	84.9	44.9	Forest Knolls	50.0	82.9	32.9
Flower Valley	22.2	75.6	53.4	Garrett Park	53.8	95.2	41.4
Forest Knolls	28.6	82.9	54.3	Georgian Forest	44.4	87.5	43.1
Gaithersburg ES	17.4	58.8	41.4	Glen Haven	6.7	50.0	43.3
Galway	14.3	65.7	51.4	Highland View	12.5	63.6	51.1
Glenallan	27.0	76.2	49.2	Kemp Mill	19.0	77.8	58.8
Jones Lane	0.0	81.1	81.1	Marshall	16.7	60.0	43.3
Kemp Mill	29.6	77.8	48.2	Maryvale	18.8	66.7	47.9
Lake Seneca	33.3	78.4	45.1	McNair	23.1	54.2	31.1
Maryvale	8.3	66.7	58.4	North Chevy Chase	57.1	92.9	35.8
Meadow Hall	27.3	81.3	54.0	Oak View	30.3	71.4	41.1
North Chevy Chase	47.4	92.9	45.5	Oakland Terrace	29.4	70.6	41.2
Piney Branch	26.4	73.2	46.8	Olney	16.7	75.6	58.9
Rock Creek Forest	42.9	85.7	42.8	Piney Branch	15.2	73.2	58.0
Rockwell	12.5	69.9	57.4	Rachael Carson	6.7	65.6	58.9
Stedwick	25.0	70.4	45.4	Rock View	21.4	54.5	33.1
Stone Mill	16.7	77.3	60.6	Rolling Terrace	36.2	82.4	46.2
Westover	36.4	81.0	44.6	Rosemont	20.0	50.0	30.0
Whetstone	32.4	78.4	46.0	Sequoyah	22.2	65.3	43.1
Woodfield	10.0	75.4	65.4	Strawberry Knoll	20.0	61.5	41.5
Woodlin	31.6	80.0	48.4	Watkins Mill ES	22.2	65.9	43.7
-	-	-	-	Westover	0.0	81.0	81.0
-	-	-	-	Woodlin	16.7	80.0	63.3

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.19 reveals the following about grade 5 students:

- The percentage of African American students meeting the satisfactory standard ranged from none (Bethesda and Jones Lane) to 50 percent (Bells Mill).

- In comparison with African American students, the percentages of White students meeting the satisfactory standard ranged from 58.8 percent (Gaithersburg) to 92.9 percent (North Chevy Chase).
- The poorest performance occurred, aside from Bethesda and Jones Lane, at Maryvale (8.3 percent) and Woodfield (10 percent).
- Schools with the greatest discrepancy between African American and White students included Bethesda (88.7 percent), Jones Lane (81.1 percent), and College Gardens (70.2 percent).
- The percentage of Hispanic students meeting the satisfactory level ranged from none (Westover) to 57.1 percent (North Chevy Chase).
- In comparison with Hispanic students, the percentages of White students meeting standard ranged from 47.8 percent (Brookhaven) to 95.2 percent (Garrett Park).
- In addition to students at Westover, the poorest performance among Hispanic students occurred at Glen Haven and Rachel Carson (6.7 percent).
- Schools with the greatest discrepancy between Hispanic students and White students included Westover (81 percent) and Bethesda (74.4 percent).

Exhibit 2.20
Distribution of Percentages of Students in Schools
Meeting the Satisfactory Standard in Mathematics Grade 8 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 8						
Middle School	**AA**	**Wh**	**Difference**	**Middle School**	**HIS**	**Wh**	**Difference**
Argyle MS	35.8	73.7	37.9	Argyle MS	34.5	73.7	39.2
Baker MS	55.6	79.8	24.2	Baker MS	57.1	79.8	22.7
Banneker MS	41.4	64.4	23.0	Banneker MS	56.3	64.4	8.1
Briggs Chaney MS	41.0	76.9	35.9	Briggs Chaney MS	47.4	76.9	29.5
Cabin John MS	42.1	90.6	48.5	Cabin John MS	80.0	90.6	10.6
Clemente MS	22.6	68.3	45.7	Clemente MS	34.8	68.3	33.5
Eastern MS	35.5	83.0	47.5	Eastern MS	28.4	83.0	54.6
Farquhar MS	54.8	75.2	20.4	Farquhar MS	53.8	75.2	21.4
Forest Oak MS	53.6	79.4	25.8	Forest Oak MS	39.0	79.4	40.4
Frost MS	78.6	90.5	11.9	Frost MS	81.3	90.5	9.2
Gaithersburg MS	40.8	72.3	31.5	Gaithersburg MS	40.0	72.3	32.3
Hoover MS	66.7	88.2	21.5	Hoover MS	88.2	88.2	0.0
Julius West MS	36.6	74.1	37.5	Julius West MS	34.2	74.1	39.9
Key MS	44.0	79.4	35.4	Key MS	34.1	79.4	45.3
King MS	33.8	72.6	38.8	King MS	41.2	72.6	31.4
Kingsview MS	30.4	65.5	35.1	Kingsview MS	33.3	65.5	32.2
Lee MS	34.4	78.8	44.4	Lee MS	41.0	78.8	37.8
Montgomery Village MS	33.3	75.9	42.6	Montgomery Village MS	41.7	75.9	34.2
Neelsville MS	50.0	75.2	25.2	Neelsville MS	33.3	75.2	41.9
Parkland MS	34.2	55.1	20.9	Parkland MS	37.0	55.1	18.1
Pyle MS	25.0	86.0	61.0	Pyle MS	66.7	86.0	19.3
Redland MS	51.4	78.8	27.4	Redland MS	66.7	78.8	12.1
Ridgeview MS	19.4	70.3	50.9	Ridgeview MS	17.9	70.3	52.4
Rocky Hill MS	36.4	66.5	30.1	Rocky Hill MS	37.5	66.5	29.0
Rosa Parks MS	39.5	79.3	39.8	Rosa Parks MS	53.8	79.3	25.5
Sligo MS	31.9	68.5	36.6	Sligo MS	28.8	68.5	39.7

Exhibit 2.20 (continued)
Distribution of Percentages of Students in Schools
Meeting the Satisfactory Standard in Mathematics Grade 8 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 8						
Middle School	**AA**	**Wh**	**Difference**	**Middle School**	**HIS**	**Wh**	**Difference**
Takoma Park MS	39.8	86.0	46.2	Takoma Park MS	20.4	86.0	65.6
Tilden MS	36.4	84.4	48.0	Tilden MS	50.0	84.4	34.4
Westland MS	43.2	88.3	45.1	Westland MS	34.2	88.3	54.1
White Oak MS	32.1	82.7	50.6	White Oak MS	23.1	82.7	59.6
Wood MS	43.2	66.9	23.7	Wood MS	25.7	66.9	41.2

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.20 reveals the following about grade 8 students:

- The percentage of African American students meeting the satisfactory standard ranged from 19.4 percent (Ridgeview) to 78.6 percent (Frost).
- In comparison with African American students, the percentages of White students meeting the satisfactory standard ranged from 55.1 percent (Parkland) to 90.6 percent (Cabin John).
- The poorest performance among African American students occurred at Ridgeview (19.4 percent) and Clemente (22.6 percent).
- Schools with the greatest discrepancy between African American students included Pyle (61 percent), Ridgeview (50.9 percent), and White Oak (50.6).
- The percentage of Hispanic students meeting the satisfactory standard ranged from 17.9 percent (Ridgeview) to 88.2 percent (Hoover).
- The poorest performance among Hispanic students occurred at Ridgeview (17.9 percent), Takoma Park (20.4 percent), and White Oak (23.1 percent).
- Schools with the greatest discrepancies between Hispanic students and White students included Takoma Park (65.6 percent), White Oak (59.6 percent), Eastern (54.6 percent), and Westland (54.1 percent).

Graduation from a Maryland high school requires satisfactory student achievement in reading, mathematics, writing, and citizenship. Results are reported for the functional tests at the ninth grade and eleventh grade level. For a school/district to achieve satisfactory status in mathematics, 80 percent of the population must successfully pass the test; 90 percent passing mathematics grants the school/district excellent status.

In analyzing the Maryland Functional Test, mathematics data, the auditors found that the same discrepancies, noted in other tests at other grade levels, between White students and African American and Hispanic students. Over a five-year period, at the ninth grade level, White students consistently outperformed both African American and Hispanic students in the area of mathematics. Exhibit 2.21 illustrates the discrepancies that occurred during the past five years.

Exhibit 2.21
Percentage of Students Meeting Satisfactory Standard by Ethnicity
Maryland Functional Test, Grade 9, Mathematics
Montgomery County Public Schools
1995 – 1999

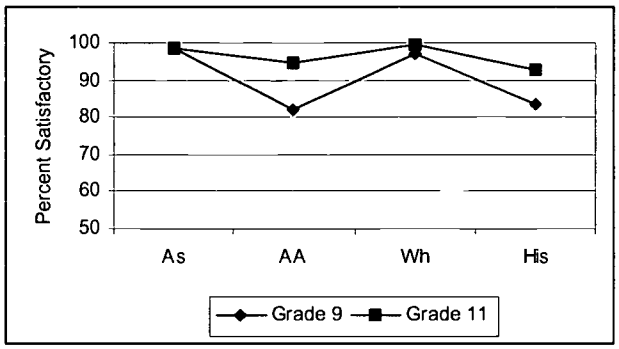


Exhibit 2.21 reveals the following about grade 9 students:

- Among Hispanic and African American students, percentages declined from 1995 to 1996, increased in 1997, and dropped from 1997 to 1998.
- Among all groups, the percentage of those meeting the state standard increased from 1995 to 1999.
- The smallest percentage of students meeting the satisfactory level was found among African American students (81.8 percent) and Hispanic (83.5 percent).

An analysis of all high schools revealed variations in the discrepancies between White students and the two ethnic minority groups (African American and Hispanic) with only three exceptions (Poolesville, Winston Churchill, and Wootton. Exhibit 2.22 illustrates the extent to which White students outperformed African American and Hispanic students.

Exhibit 2.22
Distribution of Percentages of Students in Schools
Meeting the Satisfactory Standard in Mathematics Grade 9 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 9						
School	**AA**	**WH**	**Difference**	**School**	**HIS**	**WH**	**Difference**
Albert Einstein	77.9	95.4	17.5	Albert Einstein	83.7	95.4	11.7
Bethesda-Chevy Chase	80.4	98.8	18.4	Bethesda-Chevy Chase	86.4	98.8	12.4
Blake	87.3	97.9	10.6	Blake	86.7	97.9	11.2
Damascus	88.9	96.8	7.9	Damascus	91.7	96.8	5.1
Gaithersburg	69.5	92.8	23.3	Gaithersburg	76.7	92.8	16.1
Kennedy High	87.0	97.6	10.6	Kennedy High	91.3	97.6	6.3
Magruder High	84.3	97.8	13.5	Magruder High	86.0	97.8	11.8
Montgomery Blair	79.2	99.0	19.8	Montgomery Blair	78.2	99.0	20.8
Northwest	81.0	96.9	15.9	Northwest	87.5	96.9	9.4
Paint Branch	89.7	97.9	8.2	Paint Branch	82.6	97.9	15.3
Poolesville	100.0	97.5	n(2.5)	Poolesville	100.0	97.5	n(2.5)
Quince Orchard	71.6	91.6	20.0	Quince Orchard	86.0	91.6	5.6

Exhibit 2.22 (continued)
Distribution of Percentages of Students in Schools
Meeting the Satisfactory Standard in Mathematics Grade 9 by Ethnicity
Maryland State Performance Assessment Program
Montgomery County Public Schools
1999

	Grade 9						
School	**AA**	**WH**	**Difference**	**School**	**HIS**	**WH**	**Difference**
Richard Montgomery	87.5	98.7	11.2	Richard Montgomery	90.6	98.7	8.1
Rockville	82.3	98.4	16.1	Rockville	80.4	98.4	18.0
Seneca Valley	79.4	93.4	14.0	Seneca Valley	76.7	93.4	16.7
Sherwood High	86.9	98.0	11.1	Sherwood High	90.0	98.0	8.0
Springbrook	84.7	100.0	15.3	Springbrook	82.1	100.0	7.9
Walt Whitman	84.6	99.1	14.5	Walt Whitman	93.3	99.1	5.8
Walter Johnson	81.1	98.2	17.1	Walter Johnson	92.6	98.2	5.6
Watkins Mill	77.8	94.5	16.7	Watkins Mill	87.3	94.5	7.2
Wheaton	84.4	92.9	8.5	Wheaton	74.8	92.9	18.1
Winston Churchill	100.0	100.0	0.0	Winston Churchill	100.0	100.0	0.0
Wootton	95.5	99.0	3.5	Wootton	100.0	99.0	n(1.0)

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.22 reveals the following about grade 9 students:

- The percentage of African American students meeting the satisfactory standard ranged from 69.5 (Gaithersburg) to 100 percent (Poolesville and Winston Churchill).
- The poorest performance among African American students occurred at Gaithersburg (69.5 percent) and Quince Orchard (71.6 percent).
- The percentage of White students meeting the satisfactory level ranged from 91.6 percent (Quince Orchard) to 100 percent (Winston Churchill and Springbrook).
- Schools with the greatest discrepancy between African American and White students included Gaithersburg (23.3 percent) and Quince Orchard (20 percent).
- The percentage of Hispanic students meeting the satisfactory level ranged from 83.9 percent (Wheaton) to 100 percent (Poolesville, Winston Churchill, and Wootton).
- The poorest performance among Hispanic students occurred at Wheaton (74.8 percent), Gaithersburg (85.9 percent), Montgomery Blair (78.2 percent), and Seneca Valley (76.7 percent).
- Schools with the greatest discrepancy between Hispanic and White students included Montgomery Blair (20.8 percent), Rockville (18.0 percent), and Wheaton (18.1 percent).

Student Placement: The *1999 Maryland School Performance Report: State and Systems* noted that in Montgomery County, "Students with outstanding abilities in general intellectual capabilities and specific attitudes are identified by observations, assessment, academic achievement, standardized tests, and recommendations." No disaggregated data for enrollment in gifted and talented programs were provided. Aggregated data indicated that "students provided services are from grade 2 to grade 5 (25 percent); from grade 6 to grade 8 (30 percent); and from grade 9 to grade 12 (30 percent)." The CRT is used as one means of identifying gifted students. Given the evidence that African American and Hispanic students' performance on both MSPAP and Montgomery County Public Schools CRT is well below that of White and Asian students, these ethnic groups would not meet the current criteria for eligibility for placement in gifted and/or honors programs.

Chalkboard Math Practice – Oak View Elementary

A sample of interview data reflects the problems and beliefs that limit the opportunities of African American and Hispanic students to participate in gifted and/or advanced programs. Statements below are representative of some of the comments made by administrators, staff, board members, parents, and community representatives:

- "We have a large under-representation of minority students in honors."
- "We work well with those who surface as gifted and motivated. The identification process falls short–particularly where minority students are concerned."
- "There is not a loud voice from the disadvantaged group."
- "There are two systems in Montgomery County...we need to look at the dual system and close the gap."
- "We do not have a sense of community...we have been splintered by gifted and talented, special education...everyone has an agenda."
- "A duality of the curriculum exists...we do not have high expectations at all campuses.... We need to raise the bar and close the gap."
- "This is a good district for star performers...."
- "My biggest challenge is to get the teaching culture to change. We have attitudes about which kids will get the golden ring. We find too many ways to exclude kids rather than include them."
- "Focus on the lowest kids...principals actually told us that!"
- "Math B has too much in it for the low kids, and not enough for the high kids."
- "African American students arrive in kindergarten on average behind White students. Only candidates [explanation] is that it's either genetics or background."
- "Teachers are told to teach all children 3rd grade math. The kids (African American) can't succeed; it's wishful thinking."
- "Things happen in the first five years (of children's lives); it will take many years for them (African American parents) to learn how to parent children."

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- "Nearly every class of students is performing about two years behind. Gifted take algebra in the 8th grade. When those kids–low achieving African American children--arrive in kindergarten, we assume they're ready, but they're below White children."

To further diminish academic opportunities for some minority groups, the district has a three-track system for student placement in mathematics. Exhibit 2.23 illustrates the tracking system in operation at the high school.

Exhibit 2.23
Secondary Mathematics Sequence Samples
Montgomery County Public Schools

Grade 9	Grade 10	Grade 11	Grade 12
Algebra 1	Principles of Geometry and Algebra	Geometry	Algebra 2
Geometry	Algebra 2 with Analysis Algebra2	Pre-calculus with Analysis Pre-calculus	AP Calculus Calculus with Applications
Mathematical Approach to Problem Solving	Algebra 1	Geometry	Algebra 2
Algebra 1	Geometry	Algebra 2	Pre-calculus

Grade 9 students who have not achieved the level of competency required for enrollment in the traditional algebra 1 course are enrolled in mathematical approach to problem solving. Several other courses are made available for students lacking requisite skills for completing algebra 1, (e.g., related mathematics A and B and applications of mathematics A and B). As noted in Exhibit 2.23, students who enter high school enrolled in mathematical approach to problem solving are not likely to have access to pre-calculus or AP calculus.

The auditors noted during site visits that in several mathematics classes provided for students identified as low achievers in mathematics the majority of the students were African American. Classes for grade 9 students enrolled in the algebra 1 courses were predominately White. Honors classes were nearly all White. In many of the related mathematics courses, the populations enrolled were almost totally African American. Thus, in many of the mathematics classes, students were racially segregated.

The auditors found that over a three-year period, the percentages of African American and Hispanic students were much less than the percentages of White and Asian students successfully completing algebra 1 or higher math courses. Likewise, fewer high school African American and Hispanic students were enrolled in Honors/Advanced Placement courses. Greater percentages of White and Asian grade eight students successfully complete algebra 1 or higher math courses when compared to African American and Hispanic students.

Exhibit 2.24
Percentages of Students Successfully Completing Algebra
Student Enrollment in Honors/Advanced Placement Courses
Montgomery County Public Schools
1996-1998

Category	*AA			*AS			*His			*Wh		
	96	97	98	96	97	98	96	97	98	96	97	98
Grade 9, Successfully Completing Algebra 1 or Higher	51.4	48.2	45.4	85.5	85	82.1	43.6	40.7	42.8	82.2	83.2	81.7
Students in Honors/AP	31.1	30.7	29.6	68.9	68.3	68.8	30.5	30.7	31.7	61.1	62.1	63.6
Grade 8, Successfully Completing Algebra 1 or Higher	12.5	11.7	10.7	50.1	52.8	51	11.4	11.8	12.7	40.6	41.6	41.3

Note: *AA = African American; *HIS = Hispanic; and *WH = White

Exhibit 2.24 illustrates the following:

- Over a three-year period, the percentages of grade 9 African American and Hispanic students successfully completing algebra 1 or higher declined.
- Among White students, the percentage of grade 9 students completing algebra 1 or higher increased in 1997 but declined in 1998.
- White students (81.7 percent) successfully completing algebra 1 in grade 9 exceeded both African American (45.4 percent) and Hispanic (42.8 percent) students.
- During the three-year period, the percentage of grade 8 African American students successfully completing algebra 1 or higher declined from 12.5 percent to 10.7 percent. The Hispanic completion rate increased from 11.4 percent in 1996 to 12.7 percent in 1998.
- The percentage of White grade 8 students completing algebra 1 or higher increased from 40.6 percent in 1996 to 41.6 percent in 1997, but declined in 1998 (41.3 percent).
- Each year, White student enrollment in Honors/Advanced Placement courses far exceeded the enrollment of both African American and Hispanic students.
- In 1998, 29.6 percent of the African American students were enrolled in Honors/Advanced Placement courses.
- Among Hispanic students, in 1998, 42.8 percent were enrolled in Honors/Advanced Placement courses.
- Conversely, 63.6 percent of the White students were enrolled in Honors/Advanced Placement courses.

Other indicators of the wide discrepancies between White students and the two minority groups were identified in the review of the distribution of grades in selected mathematics courses. Grade distributions by race are presented in Exhibit 2.25, Exhibit 2.26, Exhibit 2.27, and Exhibit 2.28.

Exhibit 2.25
Distribution of Grades in Algebra IA, in Middle Schools
Montgomery County Public Schools
January 2000

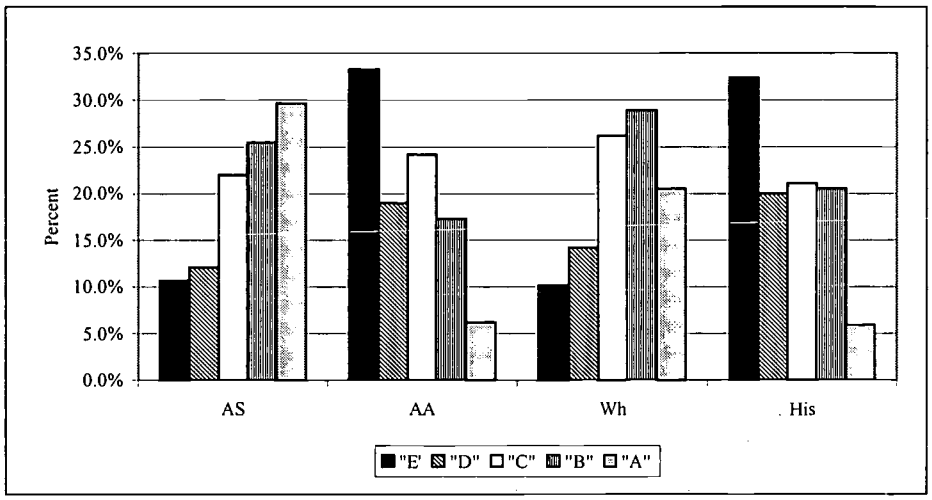


Exhibit 2.25 reveals the following:

- Among students receiving failing grades ("E"), African Americans received the highest percentage (33.3 percent); 32.4 percent of the Hispanics students received failing grades ("E").
- Conversely, 10.2 percent of White students received failing grades ("E"); 10.7 percent of the Asian students received failing grades of "E."
- Only 6.2 percent of African Americans and 5.9 percent of Hispanics received a grade of "A."

Exhibit 2.26
Distribution of Grades in Algebra IA, in 9th Grade
Montgomery County Public Schools
January 2000

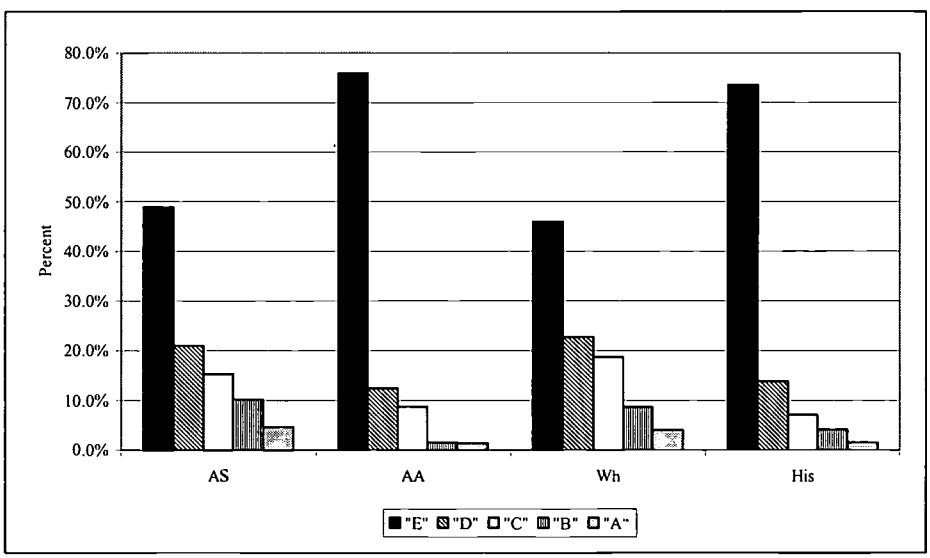


Exhibit 2.26 reveals the following:

- Among 9th grade African American students enrolled in algebra 1A, 75.9 percent received failing grades, 73.5 percent of the Hispanic also students received failing grades.
- African American students received the smallest percentage of "As" (1.4 percent); 1.5 percent of the grades among African Americans were "Bs."
- Similarly, 1.5 percent of the Hispanic students earned "As" and 4.1 percent earned "Bs" in 9th grade algebra 1A.
- In contrast, four percent of the White students earned "As" and 8.6 percent earned "Bs."

Exhibit 2.27
Distribution of Grades in Geometry IA
Montgomery County Public Schools
January 2000

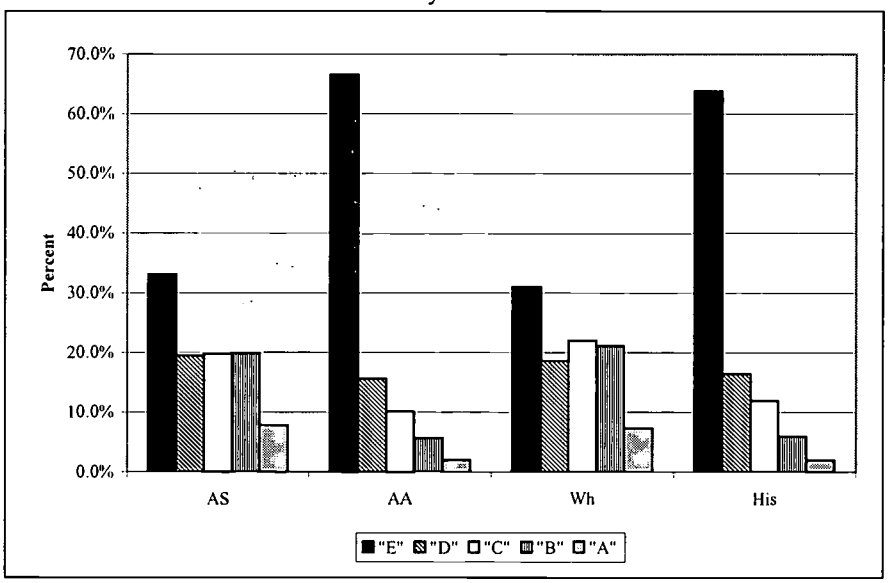


Exhibit 2.27 reveals the following:

- Among African American Students, 66.6 percent received failing marks in geometry; 63.8 percent of the Hispanics received failing marks, which is almost two times the percentage of Whites receiving failing marks.
- Only two percent of the African American and Hispanic students received "As."
- Only 5.7 percent of the African American students and 5.9 percent of the Hispanic students received "Bs" in geometry.

Exhibit 2.28
Distribution of Grades in Honors Geometry IA
Montgomery County Public Schools
January 2000

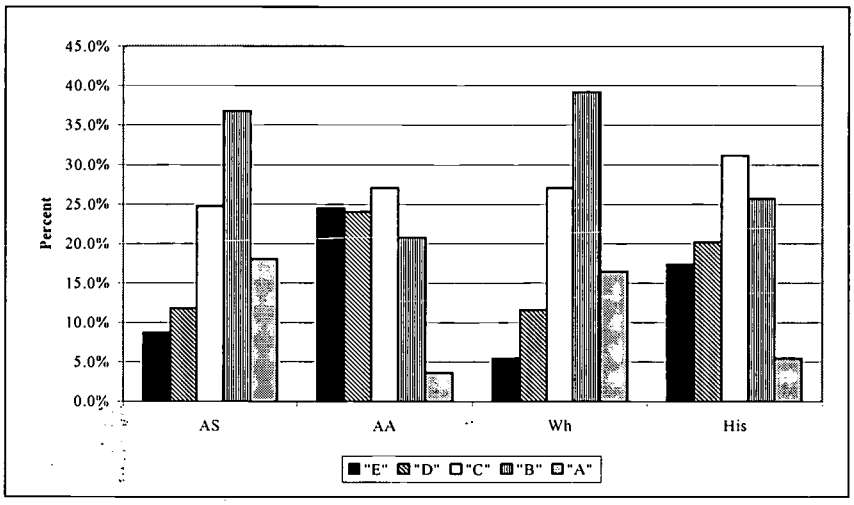


Exhibit 2.28 reveals the following:

- African American students received the greatest percentage of "Fs" (24.5 percent) followed by Hispanic students, of whom 17.4 percent received "Fs" in honor geometry 1A.
- Only 3.6 percent of the African Americans and 5.5 percent of the Hispanic students received "As."
- In contrast, among White students, 16.5 percent received "As," and 39.2 percent received "Bs."

Analysis of AP disaggregated data revealed similar discrepancies in both the total number of students enrolled, and in the level of performance. Exhibit 2.29 and Exhibit 2.30 presents the enrollment data for students in AP statistics and calculus disaggregated by gender and ethnicity.

Exhibit 2.29
Number of Students Enrolled in AP Statistics by Gender and Ethnicity
Montgomery County Public Schools
1998

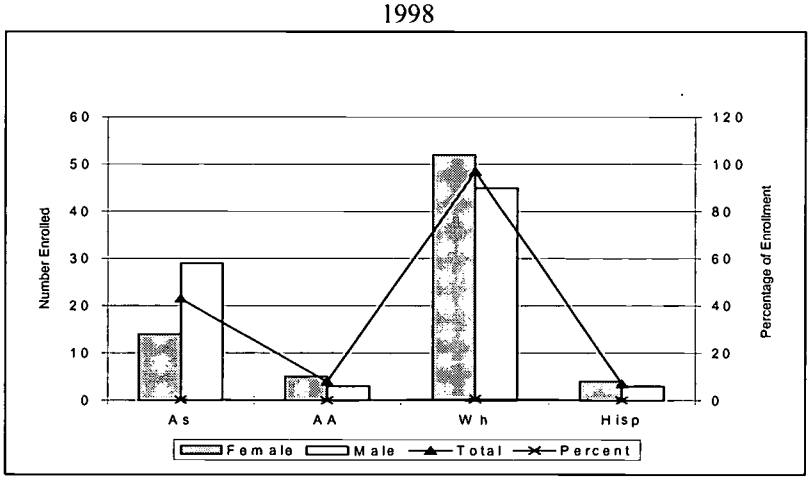


Exhibit 2.29 reveals the following:

- Greater numbers of females were enrolled in statistics when compared to males in each ethnic group, with the exception of Asian students.
- White students (62.6 percent) represented the largest percentage of students enrolled in statistics when compared to African American (5.2 percent) and Hispanic (4.5 percent) students. The percentage of Asian students was 27.7 percent.

Exhibit 2.30
Number of students Enrolled in AP Calculus by Gender and Ethnicity
Montgomery County Public Schools
1998

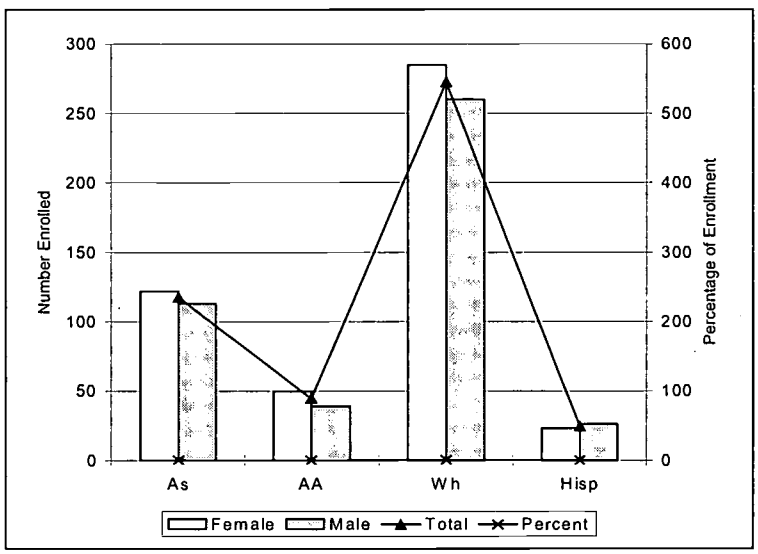


Exhibit 2.30 reveals the following:

- Greater numbers of Asian, African American, and White females were enrolled in AP calculus when compared to male students.
- Among Hispanic students, 26 male students were enrolled in AP calculus, compared to 23 females.
- White students (59.2 percent) represented the largest percentage of students enrolled in AP calculus when compared to African American (9.7 percent) and Hispanic students (5.3 percent). The percentage of Asian students was 27.7 percent.

Ratings on AP tests range from one to five. Successful performance on AP tests requires a rating of three or higher. Analysis of student performance in AP mathematics courses revealed that White students outperformed all other students in each of the courses: calculus AB, calculus BC, and statistics. Exhibit 2.31 illustrates the number enrolled and the achievement levels of African American, Asian, White, and Hispanic students.

Exhibit 2.31
Scores on AP Mathematics Tests
Montgomery County Public Schools
1999

Ethnicity	Calculus AB		Calculus BC		Statistics	
	% 3+	# Tested	% 3+	# Tested	% 3+	# Tested
African American	71.4	7	50.0	18	66.7	3
Asian	79.7	64	79.3	164	86.7	45
Hispanic	71.4	14	66.7	12	100.0	5
White	93.2	148	84.8	250	91.7	108

Exhibit 2.31 reveals the following:

- Eighteen or fewer African American and/or Hispanic students were tested in the AP courses.
- Compared to African American and Hispanic students (71.4 percent), the percentage of White students earning a score of three or higher in calculus AB was 93.2 percent.
- Slightly more than 84 percent of the White students earned a score of three or higher on the calculus BC test.
- In calculus BC, half of the African American students earned a score of three or higher on the AP test; 66.7 percent of the Hispanic students earned a score of three or higher.

Students intending to attend college take the SAT tests. The auditors found that White student performance exceeded that of African American and Hispanic students. Slight variations were found in examining SAT data when disaggregated by gender. Exhibit 2.32 shows the students' performance disaggregated by ethnicity, and Exhibit 2.33 displays those SAT math scores by gender.

Exhibit 2.32
SAT Test Scores by Ethnicity
Montgomery County Public Schools
1995 to 1999

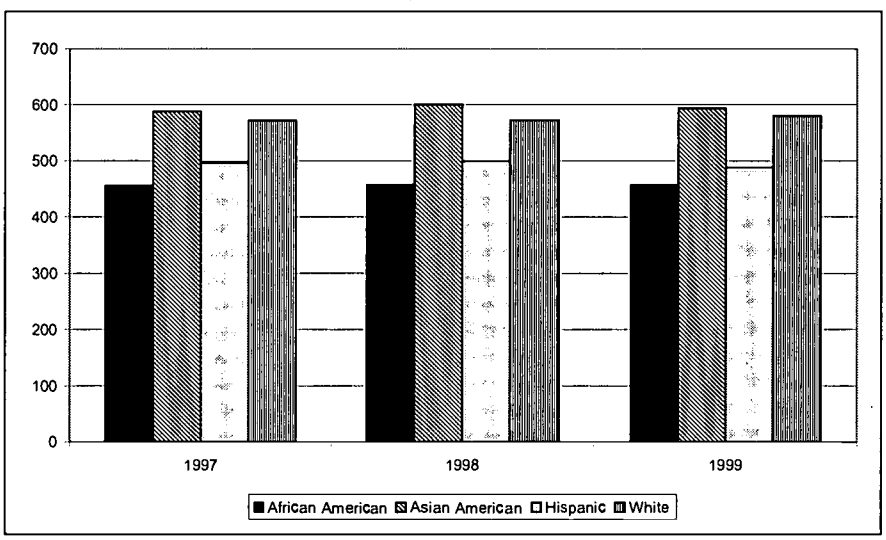


Exhibit 2.32 reveals the following:

- From 1997 to 1999, student performance on the math section of the SAT fluctuated among all groups. White scores did not do anything more spectacular than other groups – they fluctuated also.

- Each year, White and Asian scores, 580 and 594 respectively, exceeded those of African American (457) and Hispanic students (488).
- In each of the three years, African American SAT scores were lower than the scores of any of the other three groups.

Exhibit 2.33 displays those SAT math scores by gender.

Exhibit 2.33
SAT Math Scores by Gender
Montgomery County Public Schools
1997 to 1999

Comparison Group	1995	1996	1997	1998	1999
Female	533	536	538	541	541
Male	563	563	571	571	571

Exhibit 2.33 reveals the following:

- Test scores for both groups increased from 1995 to 1999.
- Female scores increased by seven points; male scores increased by eight points.
- Male students earned higher test scores than females in each of the five years.

Analysis of SAT student performance by individual high schools revealed wide discrepancies between White students and the two minority groups, African American and Hispanic. This information is presented in Exhibit 2.34.

Exhibit 2.34
SAT Math Scores by High Schools by Ethnicity
Montgomery County Public Schools
1999

Chevy Chase		**Kennedy**		**Seneca Valley**	
African American	456	African American	441	African American	416
Asian American	613	Asian American	561	Asian American	537
Hispanic	436	Hispanic	447	Hispanic	448
White	603	White	568	White	534
Blair		**Magruder**		**Sherwood**	
African American	453	African American	487	African American	451
Asian American	649	Asian American	572	Asian American	519
Hispanic	487	Hispanic	493	Hispanic	531
White	658	White	574	White	549
Churchill		**Richard Montgomery**		**Springbrook**	
African American	459	African American	534	African American	462
Asian American	651	Asian American	596	Asian American	571
Hispanic	564	Hispanic	565	Hispanic	451
White	605	White	627	White	583
Damascus		**Paint Branch**		**Watkins Mill**	
African American	*	African American	451	African American	470
Asian American	470	Asian American	560	Asian American	554
Hispanic	*	Hispanic	482	Hispanic	496
White	549	White	575	White	549
Einstein		**Poolesville**		**Wheaton**	
African American	415	African American	*	African American	424
Asian American	486	Asian American	*	Asian American	493
Hispanic	448	Hispanic	*	Hispanic	465
White	532	White	564	White	518

Exhibit 2.34 (continued)
SAT Math Scores by High Schools by Ethnicity
Montgomery County Public Schools
1999

Gaithersburg		Quince Orchard		Whitman	
African American	485	African American	468	African American	527
Asian American	550	Asian American	610	Asian American	642
Hispanic	499	Hispanic	523	Hispanic	550
White	551	White	568	White	630
Walter Johnson		**Rockville**		**Wootton**	
African American	480	African American	493	African American	466
Asian American	586	Asian American	569	Asian American	658
Hispanic	493	Hispanic	469	Hispanic	571
White	574	White	559	White	586

* = Missing – data not available

Exhibit 2.34 reveals the following:

- SAT scores of African Americans ranged from 415 (Einstein) to 534 (Richard Montgomery); almost all of the scores were less than 500.
- In nearly two-thirds of the schools, African American students earned the lowest SAT score.
- Hispanic students were the next lowest performing ethnic groups.
- Among Hispanic students, scores ranged from 436 (Bethesda) to 571 (Wootton).
- Conversely, SAT scores of White students ranged from 518 (Wheaton) to 658 (Blair). Nearly one in five of the scores was above 600.

In summary, efforts of those in the district to "raise the bar and bridge the gap" in the "Success for Every Student" initiative have failed to narrow the discrepancies in the performances between White students and the two minority groups (African American and Hispanic). Analysis of all test data indicates that White students outperform African American and Hispanic students. Further, African American and Hispanic students are not likely to enroll in advanced or honors courses. Those that are enrolled in such courses as algebra, geometry, honors geometry, and AP mathematics courses receive a greater percentage of failing grades when compared to other groups. Schools with high percentages of FARMS students are more likely to fail to meet the district and/or state standards. While many in the district speak of finding means to close the gaps, others, sometimes more vocal, exhibit strong beliefs that some non-White groups and those who are eligible for FARMS are incapable of achieving at a level comparable to White students.

Finding 3: Building Priorities, Services, and Offerings Reflect Insufficient System Congruity and Lack of Control.

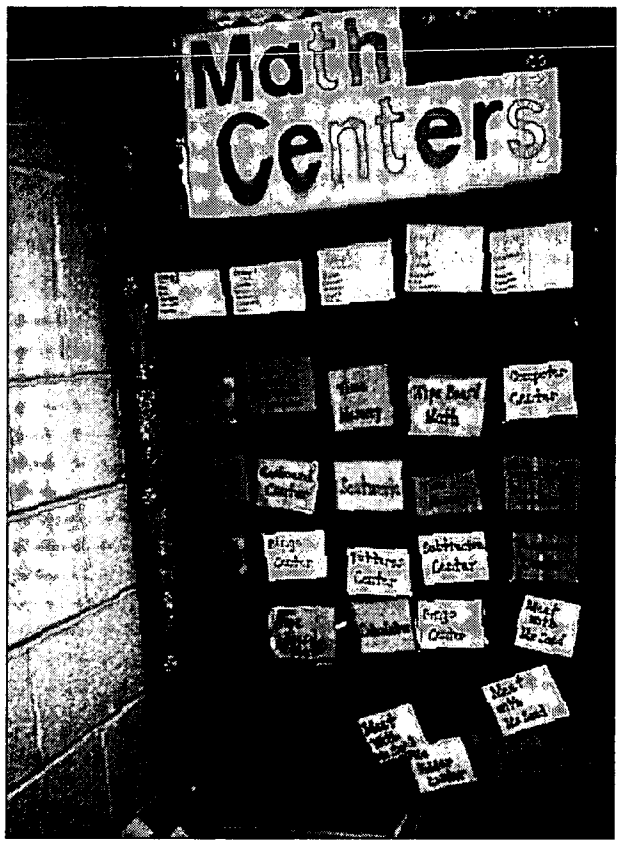
In an effective school system, all students have equal access to the offerings and services provided by the district. Access to these programs should not be dependent on any social or cultural factor or in which building or neighborhood a student goes to school. The auditors sought to determine if the services, offerings, and building priorities were comparable for every student throughout the district, and to determine if the system was operating as a coherent organization in the delivery of math curriculum and instruction.

An effective school system also maintains quality control for ensuring the maintenance of proper standards. Quality control is not achieved with individual schools autonomously making decisions regarding curriculum and instruction. Individual school autonomy in curriculum and instruction produces inequity and disparity of educational opportunity within the system. The auditors visited a number of schools and interviewed key individuals about consistency across the system. A few sample comments noted by the auditors included the following:

- "Schools operate like independent districts." (administrator)
- "I think every teacher is creating their own (math) curriculum." (principal)

The auditors found that school performance or student achievement is not tied effectively to principal's job expectations or responsibilities. The auditors also found that individual schools have different priorities. Some sample comments made included:

- "(Training) depends on the principal and what they choose to do." (administrator)
- "We're going to do what we think is right for our kids. One size doesn't fit all." (principal)
- "We have to 'hand crank' everything (without help)." (teacher)
- "There are holes because there's no time for practice (and too much to cover)." (teacher)



Math Centers Approach – Takoma Park Elementary

Interviews with district-level instructional and administrative personnel, parent, and board members supported the finding of variations in building priorities, services, and offerings, with little system congruity. Vertical articulation of curriculum is inconsistent from grade to grade, and horizontal coordination across classrooms is not any better, as reflected in the following comments from individuals interviewed:

- "Where you live in this county will determine what kind of math program you will receive." (principal)
- "Many schools have different tests; no one identifies what's best." (principal)
- "(There is) inconsistency in classroom use of textbooks." (administrator)
- "Some sixth grades have two levels, some have three levels, some have four levels in mathematics." (administrator)
- "(Math) curriculum is a collection of programs strung together." (principal)

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Interventions in mathematics were abundant, but results about their efficacy are lacking. The auditors found that the plethora of interventions was a function of the principals' independence in determining instructional strategies and approaches. Evidence of this fragmentation included the following initiatives that were underway or planned for implementation at various schools district-wide:

- Linkages to Learning (family counseling service);
- Success for Every Child (school improvement plans);
- Singapore Math Pilot Study (the Singapore curriculum);
- Lockheed Mentoring Program;
- Pathways Program;
- Math Counts (contest);
- Signature Schools (focus on specific topics);
- Homework Club (for underachievers); and
- Summer Math Institute (one school).

Many other interventions were noted. Some of the interventions appeared to have value, but the auditors were unable to determine if this conclusively. Without needs-based objectives, and feedback on performance against those objectives, it was not possible to determine efficacy of interventions.

Some of the interventions appeared politically driven. The Singapore math program is being tried "because of some heat received from a couple of community critics" according to one administrator. The administrator was aware of many problems with Singapore math, including British spellings, Asian context and culture ("if a child has five durian and gives away two durian...."), Singapore currency and money, and the absence of manipulatives due to the abstract focus. The implementation of this program was characterized as out of control by administrators. One principal noted, "we look at new programs, and if it [sounds] o.k., we buy it and do it."

Principals reported other problems in the management of curriculum. Algebra placement has forced principals of middle schools to use the 6th grade testing scores for 8th grade algebra placement because the 7th grade scores arrive too late from the district. Math within the Montgomery County Public Schools was found to be hierarchical–comprised of many layers. Training levels of math teachers are questionable. At one middle school, no math teachers were certified in secondary mathematics (6-12). Without proper qualifications, it is not probable that principals can ensure quality control of curriculum and instruction and ensure that all children have equal access to content, services, and offerings. Questions to principals and teachers reflected a lack of understanding of the use of deep alignment (*cf.* Thorndike Transfer Theory)[4] in teaching content and context in mathematics that will readily have application in other courses, schoolwork, day-to-day living, or future careers. Principals did not refer to monitoring curriculum as an essential part of producing achievement.

The auditors found that curriculum and instructional practices widely varied across schools, and little or no attention is paid to system congruity. In addition, the different content selected within the classrooms and schools and the contexts demonstrated little relationship to other grade levels, classrooms, or system expectations for learners.

[4] E.L. Thorndike conceptualized the need for teaching "situational contexts" similar to future applications or uses of knowledge for "transfer" of learning from situation to situation. In effect, classroom learning has to parallel and emulate the real world from which testing is derived.

Finding 4: Current Board Policies Erode Board Governance and Are Inadequate to Provide Direction for Quality Control of the Mathematics Curriculum.

Clearly delineated curriculum management policies provide fundamental control and focus for the entire school system. Well-written policies establish commonly understood standards for the development of the written curriculum, the implementation of that curriculum and the evaluation of students and programs. They provide an operational framework for management of the curriculum by establishing the structure for its design and delivery and a systematic basis for decision-making and standardized practice across a variety of settings. Because of this important role, the analysis and evaluation of curriculum policies is an important part of the curriculum management audit.

In order to serve as an effective guide for decision-making at all levels of the organization; a school district's policy framework needs to be specific so that anyone needing to make decisions can be guided by the relevant policies. When policies are absent or nonspecific, there is no effective guidance for administrators and teachers. If policies do not guide practice, they are not useful in providing direction and the system becomes fragmented, idiosyncratic, out of control.

The auditors reviewed the curriculum board policies provided to the audit team by the Montgomery County Public Schools and assessed those policies by comparing their content to the audit criteria for adequate curriculum management policies. The auditors examined each relevant policy to determine whether any of the 22 criteria were present. The audit team also interviewed board members, administrators, teachers, and community members to determine their perceptions regarding the relationship between policy statements and curriculum development, implementation and assessment.

The board policies were found to be inadequate with respect to curriculum management, including the academic area of mathematics. The policies provided to the audit team provide minimal direction for decision-making. Exhibit 4.1 below lists the policies relevant to curriculum management, which were reviewed by the auditors.

Exhibit 4.1
Board of Education Policies Provided to the Auditors for Review
Montgomery County Public Schools

Policy Code	Description	Adoption Date
ACD	Quality Integrated Education	17 May 93
CEB-RA (Regulation)	Role and Membership of the Council on Instruction	28 Jul 98
IEA	Framework and Structure of Early Childhood/Elementary Education	27 Jun 88
IEB	Middle School Education	22 Jun 92
IED	Framework and Structure of High School Education	27 Jun 88
IEF	Early Childhood Education	22 Jul 91
IEF-RA (Regulation)	Early Childhood Education	17 Jul 92
IFB	Citizen Review of Curricular and Instructional Materials	Dec 97
IFB (Policy)	Citizen Review of Curricular and Instructional Materials	Dec 97
IFB-EA (Exhibit)	Curriculum Guides and Courses of Study	12 Dec 97
IFB-EA (Statute)	Curriculum Guides and Courses of Study	12 Dec 97
IFB-RA (Regulation)	Development and Approval of Curriculum and Supporting Materials	Dec 86
IFB-RA (Regulation)	Development and Approval of Curriculum and Supporting Materials	Dec 96
IIB	Evaluation and Selection (of Instructional Materials)	1 Jun 00
IIB-RA (Regulation)	Evaluation and Selection of Instructional Materials and Library Books	1 Jun 00
IKA	Grading and Reporting	14 Apr 93
IKA-RA (Regulation)	Grading and Reporting	1 Oct 96
IOA	Gifted and Talented Education	14 Nov 95
IOB	Education of Students with Disabilities	11 May 93
IOD	Education of English Language Learners	1 Jun 00
IOD-RA (Regulation)	Placement for Limited English Proficient Students	Oct 86

The auditors assessed the quality of district policies by comparing the content to expected audit criteria for exemplary curriculum management policies. Twenty-two criteria are organized into five categories: control, direction, connectivity and equity, feedback, and productivity. These areas represent the underlying standards for curriculum management.

The auditors examined each relevant policy to determine if the audit criteria were present in the policy. If the policy was adequate in providing specific guidance, the policy was judged to have met the criterion. The symbol "X" was placed under the "Met" column titled "Criterion." If a policy was considered too weak to meet the criterion or there was no policy regarding the criterion, a rating of "Not Met" was made. If no policies were available that related to the criterion, the Letter "M" for "Missing" was used.

Much difficulty was encountered in reviewing the policy to identify a coherent preK-12 set of required results or expectations. Policies were found in several areas pertaining to curriculum but not necessarily in all organizational sectors. For example, an early childhood policy might address an issue in curriculum, but that same issue might not necessarily be addressed at other levels (elementary, middle, high school). The organizational level approach to policy development and implementation fragments system integrity and makes system-wide quality control very difficult. In other words, having separate policies in curriculum management issues for preschool, elementary, middle, and high schools make it difficult for the Board and superintendent to exercise oversight, to implement answerability for performance and results, and to build system congruence and consistency.

A final step in determining adequacy was to total the number of criteria that had been met. In order for policies to be characterized as adequate, 70 percent or 16 in number, or more of the criteria need to be met. Overall, the Montgomery County Public Schools policies were found to be inadequate. Eight of the 22 criteria, or 37 percent, were found to provide adequate specificity for curriculum management. Board policies were insufficient to meet any of the five standards of the audit. Exhibit 4.2 presents the 22 criteria and the auditors' rating.

Comments relative to the policies examined include the following:

Control

No policies were found that gave specific direction for long-range planning or for the alignment of the written, taught, and tested curriculum. Board policy did require adoption of the curriculum, and the review process prior to recommendation to the Board was adequate. However, the policy on curriculum development and adoption (*IFB* and *IFB-RA*) did not clearly identify the required genesis of curriculum changes grounded in needs assessed by appropriate performance measures.

Direction

An "office" is held responsible for development of curriculum and supporting materials instead of the superintendent. No formal revision process is established for curriculum. There is no board policy requiring all textbooks to be approved by the Board. Policy statements were found that required that every content area had a written curriculum guide and that revision would be undertaken "regularly" (*Policy IEA*). Design and implementation of the curriculum was imprecise with references like "should be implemented to accomplish the Montgomery County Public Schools Goals of Education."

Textbooks and instructional resources were not required to be adopted by the Board, except in one policy (*IIB-RA*) the Board may hear appeals about use of specific materials. Professional staff were permitted to select instructional materials independent of any requirement for congruence with the defined curriculum of the district.

Articulation and coordination of the curriculum was not mentioned in policy except in *Policy IEF*, but not adequately to assure horizontal and vertical congruity and consistency.

Delivery of the Curriculum

In *Policies IEA, IEB,* and *IED,* principals were assigned responsibility to "carry out programs responsive to the needs" of "students (with) unique developmental characteristics." Other support functions relative to delivery of curriculum were not addressed in the policies provided.

Monitoring the Delivery of the Curriculum

Monitoring of curriculum was not specified or described adequately, and roles and responsibilities were not clearly delineated to properly monitor curriculum content and context. Schools were admonished in *Policies IEA* and *IED* to "facilitate the integration of curriculum objectives" into instructional practice, but the means to monitor that action were not explained.

Equity

Equitable access to success and access to the curriculum was strongly addressed in policy. *Policy ACD* calls for "intensive support" for underachieving student populations and schools, with resources allocated "to assist" in overcoming background characteristics. Another policy addressed the topic of equitable access to the curriculum but very weakly (*Policy IFB-RA*, requiring "assurance of compliance with ...laws, etc."), no policies were found that required equal opportunity and pupil success or that addressed the articulation and coordination of curriculum. Policies were judged to be inadequate for monitoring the delivery of curriculum, training staff, delivery of the curriculum, and assuring the predictability of written curriculum from one level to another.

Policy IEF calls for a pre-kindergarten program for "Chapter One" schools (with disadvantaged children). However, the specific qualifications for individual students enrolled in the program are less than clear. *Policy IOA* calls for "classroom, school organization, and instructional strategies" to be "designed to accommodate diversity in student backgrounds as well as their abilities and interests" but differential delivery of curriculum aimed at obtaining equal success or results did not follow in that policy.

Exhibit 4.2
Characteristics of Adequate Policies for Curriculum Management
and Auditors' Assessment
Montgomery County Public Schools

Criteria	Individual Policy Criterion		
	Policies	Met	Not Met
1. Provide for CONTROL—require			
• An aligned written, tested, and taught curriculum			M
• Philosophical statements of curriculum approach			M
• Board adoption of the curriculum	IFB, IFB-RA, CEB-RA	X	
• Accountability through roles and responsibilities	IFB-RA	X	
• Long-range planning	IED, IEA, IFB-EA		X
2. Provide for DIRECTION—require			
• Written curriculum for all subject/learning areas	IFB, IFB-RA, IEA, IFB-EA	X	
• Periodic review of the curriculum	IFB, IEA,	X	
• Textbook/resource adoption by the Board	IIB, IIB-RA, IFB-RA		X
• Content area emphasis			M
3. Provide for CONNECTIVITY AND EQUITY—require			
• Articulation and coordination of curriculum	IEA, IEB, IED, IEF		X

Exhibit 4.2 (continued)
Characteristics of Adequate Policies for Curriculum Management
and Auditors' Assessment
Montgomery County Public Schools

Criteria	Individual Policy Criterion		
	Policies	Met	Not Met
• Predictability of the written curriculum from one level to another			M
• Training staff in delivery of the curriculum	IEA, IED	X	
• Delivery of the curriculum	ICA	X	
• Monitoring of the delivery of the curriculum	IEA		X
• Equitable access to the curriculum	IEF, ACD, IEA	X	
4. Provide for FEEDBACK—require			
• An assessment plan			M
• Use of data from assessment to determine program/curriculum effectiveness and efficiency	IKA, IKA-RA, IEF		X
• Reports to the Board about program effectiveness	IOD		X
5. Provide for PRODUCTIVITY—require			
• Program centered budget			M
• Resource allocation tied to curriculum priorities	ACD	X	
• Environment to support curriculum delivery			M
• Data-driven decisions for the purpose of increasing student learning			M

Staff Development

Although staff development was mentioned in *Policies IEA, IEB,* and *IED*, it focused primarily on "all staff to improve skills" rather than on curriculum content and context. Moreover, these policies allow "reasonable autonomy" for schools to "identify and plan staff development activities." Responsiveness to data on student performance was not mentioned adequately, and in middle school policy (*IEB*), the policy was silent on curriculum relevance to staff development.

In some policies (i.e., *Policy IOD*), staff development opportunities were to "be offered to all staff." This statement is categorized as weak, because it just calls for training to be offered, not required even in cases of inadequate performance, and it addresses "all staff" despite normally wide differences among staff in professional development needs.

Feedback

Board policies were inadequate in the use of data from assessment to determine program/curriculum effectiveness and efficiency, the requirements of an assessment plan, and system for reporting information about program effectiveness to the Board. The policy framework provided no feedback for the Board to exercise their oversight role and responsibilities. In *Policy IEF*, teachers were directed to record "observations and samples of student work" to keep parents informed and to "assess each child's cognitive, social, emotional, and physical development" but the expectation was insufficiently precise to guide decision-making or actions.

Student grades in reading and mathematics are required to indicate "above grade level, on grade level, or below grade level," but the means to determine grade level was not described (*IKA-RA*). Ironically, in that same policy, instructional objectives, assessment measures, and performance objectives were defined, but use of those curriculum components was not explained other than they "must be addressed."

Productivity

No policies were found that spoke to the topic of program centered budgeting. Resource allocation was not tied to demonstrated educational needs in any policies presented; however, Board of Education goals, affirmed in 1999 call to "ensure success for every student." Allocation of resources

"to assist" under-performing students was mentioned in *Policy ACD*, but the auditors found little substantiation for the practice sufficient to close the achievement gaps noted between student groups. No policy addressed the suitability of educational environments to support curriculum delivery, and student learning was not required to be measured for the purpose of data-driven decision-making to improve achievement.

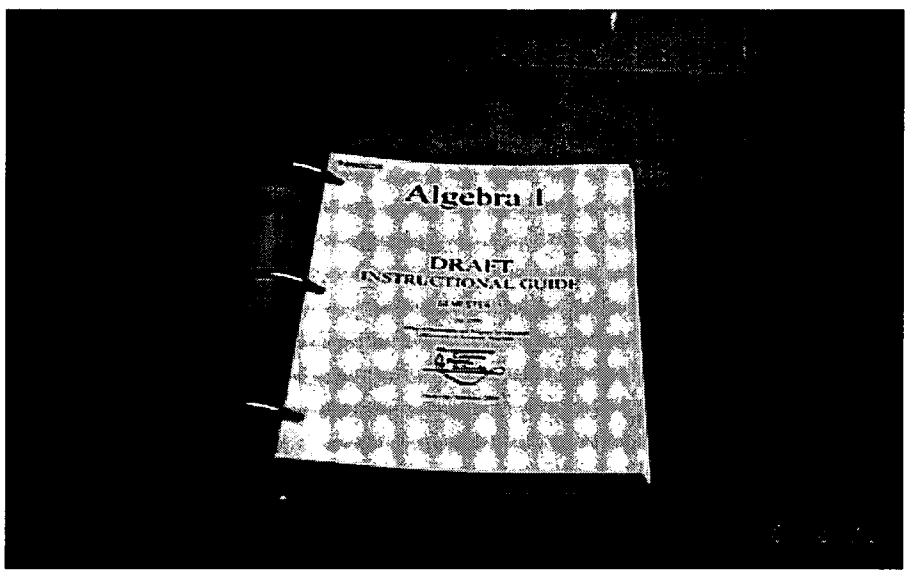
In summary, the Board of Education of the Montgomery County Public Schools has insufficient policy to guide and direct the organization in providing quality control in curriculum and instruction across the system. Without a strong policy framework and set of expectations established by the Board, the Montgomery County Public Schools are insufficiently governed to provide organizational congruence and quality control.

Finding 5: Math Curriculum Is Adequate in Scope, But Inadequate in Quality for Teacher Use in Guiding Instruction.

A clear, comprehensive, and current written curriculum is a cornerstone in a district's effort to attain its goals for student learning. Effective mathematics instruction relies on clearly written curriculum guides that span each subject or course taught at all grade levels. Curriculum guides focus on district priorities, and serve as the teachers' work plan for delivering the curriculum.

Quality curriculum guides connect the written, taught, and tested curriculum. They focus instruction on essential learning and connect the curriculum vertically and horizontally within the school organization. These documents provide purpose and direction, communicate instructional objectives, align the instructional objectives to the tested curriculum, specify necessary prerequisite skills, list instructional materials, and provide strategies for teaching. In addition, the guides must be "user friendly" and easy to translate into daily lessons.

The auditors were presented with the kindergarten through grade 12 mathematics curriculum guides for the Montgomery County Public Schools. In addition to examining the guides, staff members and teachers were interviewed to determine the extent to which guides were being used by teachers in establishing direction for their teaching in the classroom.



Algebra Draft Instructional Guide

The auditors found the written scope of the curriculum to be adequate; however, there was a magnitude of information related to the curriculum for teachers to use that provided confusion as to

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"what" to teach. This has resulted in a lack of focus and connectivity to the Maryland Learner Outcomes and Core Leaning Goals. In addition, guides provided teachers with a wide array of materials and strategies that impeded the alignment between the written, taught, and tested curriculum (see Finding 12). Quality control by the administration and Board has resulted in decisions involving content and delivery being left to individual teachers or departments without any built-in procedures requiring alignment (see Findings 3 and 6). Use of guides varied from school to school.

Scope of the Written Curriculum

The scope of the written mathematics curriculum is determined by examining each grade and mathematics course offering in the Montgomery County Public Schools. If 70 percent or more of the subjects taught have a written set of student learning outcomes, the scope is considered adequate.

The auditors found the scope of the written curriculum to be adequate. Exhibit 5.1 presents the auditors' data regarding the K – 12 scope of the written curriculum and whether there was a written curriculum for the course (noted as present or not present).

Exhibit 5.1
Grades K – 12 Scope of the Written Curriculum and the Auditors' Rating
Montgomery County Public Schools
June 2000

Subject Area	Written Curriculum	
	Present	Not Present
Math Instructional Guide, Kindergarten	X	
Math Instructional Guide, 1st	X	
Math Instructional Guide, 2nd	X	
Math Instructional Guide, 3rd	X	
Math Instructional Guide, 4th	X	
Math Instructional Guide, 5th	X	
Mathematics, 6th	X	
Mathematics, 7th	X	
Mathematics, 8th	X	
Algebra I (semester 1)	X	
Algebra I (semester 2)	X	
"Double Period Algebra" (support class)	X	
Algebra II	X	
Algebra II with Analysis	X	
AP Calculus	X	
AP Statistics	X	
Calculus with Applications	X	
Consumer Mathematics	X	
Geometry	X	
Introduction to Statistics	X	
Investigations into Mathematics	X	
MAPS 1	X	
MAPS 2	X	
Pre-Calculus	X	
Pre-Calculus with Analysis	X	
Principles of Geometry and Algebra	X	
Statistics and Mathematical Modeling	X	

As can be noted in the exhibit above:

- There are 28 courses listed in the district programs of study in mathematics.
- All programs of study in mathematics had standards and benchmarks or guides.

- The scope of the written curriculum is 100 percent; well above the 70 percent minimum audit standard.
- All courses have a written curriculum.

Minimum Guide Components and Specificity Analysis

To determine the quality of the curriculum guides presented for analysis, the auditors specifically reviewed and rated them on each of five criteria that support effective curriculum management. The criteria are listed in Exhibit 5.2.

Exhibit 5.2
Curriculum Guide Evaluation Criteria
Montgomery County Public Schools
June 2000

Criteria	Description
One	Clarity and validity of objectives
Two	Congruence of the curriculum to the testing/evaluation process
Three	Delineation by grade of the essential skills, knowledge, and attitudes
Four	Delineation of the major instructional tools in the form of textbooks and supplementary materials
Five	Clear linkages for classroom use (approaches to the subject)

The auditors assigned values of zero (0) to three for each criterion, with three representing the highest level of quality. A total score was determined for each guide by adding the ratings for each of the five criteria; the maximum possible composite score for a guide being 15. A curriculum guide is considered strong if it received a total rating of 12 points or higher. The mean ratings for each criterion and the mean for the total guide ratings were then calculated.

Exhibit 5.3 shows the ranking of the curriculum guides presented to the auditors for analysis with the specific rating for each of the five basic criteria.

Exhibit 5.3
Auditors' Rating of Subject Area Curriculum Guides Submitted to Auditors
on the Basic Minimum Guide Components and Specificity Criteria
Montgomery County Public Schools
June 2000

Curriculum Guides	Date Published	Grade Level	Criteria 1 Obj.	2 Asses.	3 S&S	4 Res.	5 App.	Total Guide Rating
Math Instructional Guide	1989	K	3	2	0	2	2	9
Math Instructional Guide	1989	1	3	2	0	2	2	9
Math Instructional Guide	1989	2	3	2	0	2	2	9
Math Instructional Guide	1989	3	3	2	0	2	2	9
Math Instructional Guide	1989	4	3	2	0	2	2	9
Math Instructional Guide	1989	5	3	2	0	2	2	9
Mathematics	1999	6	3	2	0	2	1	8
Mathematics	1993	7	2	2	0	2	1	7
Mathematics	1999	8	2	2	0	2	1	7
Algebra I (semester 1)	1999	H.S.	3	2	0	3	3	11
Algebra I (semester 2)	1999	H.S.	2	2	0	3	3	10
"Double Period Algebra" (support class)	1996	H.S.	2	0	0	2	1	5
Algebra II	1997	H.S.	3	2	0	3	3	11
Algebra II with Analysis	1998	H.S.	2	2	0	3	3	10
AP Calculus	1999	H.S.	3	2	0	3	3	11

Exhibit 5.3 (continued)
Auditors' Rating of Subject Area Curriculum Guides Submitted to Auditors
on the Basic Minimum Guide Components and Specificity Criteria
Montgomery County Public Schools
June 2000

Curriculum Guides	Date Published	Grade Level	Criteria 1 Obj.	2 Asses.	3 S&S	4 Res.	5 App.	Total Guide Rating
AP Statistics	1999	H.S.	3	2	0	2	3	10
Calculus with Applications	1998	H.S.	3	2	0	3	3	11
Consumer Mathematics	1999	H.S.	2	2	0	2	3	9
Geometry	1998	H.S.	3	2	0	3	3	11
Introduction to Statistics	1987	H.S.	2	2	0	0	0	4
Investigations into Math	1999	H.S.	3	2	0	2	3	10
MAPS 1	1991	H.S.	2	2	0	2	3	9
MAPS 2	1999	H.S.	2	2	0	2	3	9
Pre-Calculus	1998	H.S.	3	2	0	3	3	11
Pre-Calculus with Analysis	1998	H.S.	3	2	0	3	3	11
Principles of Geometry and Algebra	1999	H.S.	3	2	0	3	3	11
Statistics and Math. Modeling	1999	H.S.	3	2	0	3	3	11
TOTAL			**74**	**54**	**0**	**65**	**67**	**260**
Average (Mean) Score			**2.64**	**1.93**	**0**	**2.32**	**2.39**	**9.29**

*H.S.: High School

Overall, the curriculum guides do not contain enough information to provide teachers with a comprehensive work plan to guide their teaching. Exhibit 5.3 indicates the following:

- None of the guides reached the minimum basic adequacy score of 12 points or higher; therefore, all of the developed guides are inadequate.
- The average rating for curriculum guides was 9.29 out of a possible 15 points.
- The strongest criterion across guides was the clarity and specificity of objectives (2.64) that states for each objective the what, when (sequence within course/grade), how actual standard is performed, and amount of time to be spent learning (three points). Equally strong was the delineation of the major instructional tools (2.32) and the strategies for classroom use (2.39).
- The weakest criterion is the delineation of the prerequisite essential skills, knowledge, and attitudes (0). This states the specific documented prerequisite or description of discrete skills/concepts required prior to the learning (three points).

A summary of the ratings for each criterion follows:

Criterion 1: Clarity and Validity of Objectives

Exhibit 5.4 shows the ranking of the first criterion, clarity and validity of guide objectives, with the value rating for each of the subject area guides:

Exhibit 5.4
Clarity and Validity of Objectives
Montgomery County Public Schools
June 2000

Value/Criteria:
0. No goals/objectives present
1. Vague delineation of goals/learner outcomes
2. States tasks to be performed or skills/concepts to be learned
3. States for each objective the what, when (sequence within course/grade), how actual standard is performed, and amount of time to be spent learning

Guide	0	1	2	3
Math Instructional Guide, Kindergarten				X
Math Instructional Guide, 1st				X
Math Instructional Guide, 2nd				X
Math Instructional Guide, 3rd				X
Math Instructional Guide, 4th				X
Math Instructional Guide, 5th				X
Mathematics, 6th				X
Mathematics, 7th			X	
Mathematics, 8th			X	
Algebra I (semester 1)				X
Algebra I (semester 2)			X	
"Double Period Algebra" (support class)			X	
Algebra II				X
Algebra II with Analysis			X	
AP Calculus				X
AP Statistics				X
Calculus with Applications				X
Consumer Mathematics			X	
Geometry				X
Introduction to Statistics			X	
Investigations into Mathematics				X
MAPS 1			X	
MAPS 2			X	
Pre-Calculus				X
Pre-Calculus with Analysis				X
Principles of Geometry and Algebra				X
Statistics and Mathematical Modeling				X

The mathematics guides received a strong rating of 2.64, noting that instructional and performance objectives in the guides had stated the tasks or skills to be performed or concepts to be learned by the learner. Present in 18 of the 28 guides were:

- The sequence of when the objective would be taught within the course, and
- The amount of time that would be devoted to teaching each specified objective. Several guides stated time frames for a large collection of objectives, but did not make reference to each specified objective.

Overall, the auditors expected to find guide objectives that would provide teachers with information to "manage" their classroom situation better by assisting in decisions regarding teaching priorities (i.e., what, when, how, amount of time). The current guide objectives provided enough information to help teachers "focus" their teaching on what and when to teach specific objectives.

Criterion 2: Congruity of the Curriculum to the Testing/Evaluation Process

Exhibit 5.5 shows the ranking of the second criterion, congruity of the curriculum to the testing and evaluation process, with the value rating for each of the subject area guides:

Exhibit 5.5
Congruity of the Curriculum to the Testing and Evaluation Process
Montgomery County Public Schools
June 2000

Value/Criteria:
0. No evaluation approach
1. Some approach of evaluation stated
2. States skills, knowledge, concepts which will be assessed
3. Each objective is keyed to state or national performance evaluation

Guide	0	1	2	3
Math Instructional Guide, Kindergarten			X	
Math Instructional Guide, 1st			X	
Math Instructional Guide, 2nd			X	
Math Instructional Guide, 3rd			X	
Math Instructional Guide, 4th			X	
Math Instructional Guide, 5th			X	
Mathematics, 6th			X	
Mathematics, 7th			X	
Mathematics, 8th			X	
Algebra I (semester 1)			X	
Algebra I (semester 2)			X	
"Double Period Algebra" (support class)	X			
Algebra II			X	
Algebra II with Analysis			X	
AP Calculus			X	
AP Statistics			X	
Calculus with Applications			X	
Consumer Mathematics			X	
Geometry			X	
Introduction to Statistics			X	
Investigations into Mathematics			X	
MAPS 1			X	
MAPS 2			X	
Pre-Calculus			X	
Pre-Calculus with Analysis			X	
Principles of Geometry and Algebra			X	
Statistics and Mathematical Modeling			X	

To receive a "three" (3) mark on congruence of the curriculum to the assessment process, learner outcomes that will be tested must be identified. The teacher should know prior to teaching commencing, what instructional and performance objectives will be tested so that these objectives are more likely to be taught. This is especially important when the Maryland School Performance Assessment Program (MSPAP) is used as a measure of accountability.

Overall, the elementary guides in mathematics provided information on the skills, knowledge, and concepts that will be assessed by the Instructional System in Mathematics (ISM) and CRT provided by the district, but did not provide any indication as to which learning outcomes would be assessed on the MSPAP. Secondary guide objectives failed to show a direct correlation to the core learning outcomes. In summary, no clear correlation was made between the elementary and secondary guide

objectives and the state's "Learner Outcomes and Core Learning Goals (Maryland Core Learner Goals only address algebra 1 and geometry at the secondary level)."

Criterion 3: Delineation by Grade of the Essentials Skills, Knowledge, and Attitudes

Exhibit 5.6 shows the ranking of the third criterion, delineation of the prerequisite essential skills, knowledge, and attitudes, with the value rating for each of the subject area guides:

Exhibit 5.6
Delineation of the Prerequisite Essential Skills, Knowledge, and Attitudes
Montgomery County Public Schools
June 2000

Value/Criteria:
0. No mention of required skill
1. States prior general experience needed
2. States prior general experience needed in specified grade level
3. States specific documented prerequisite or description of discrete skills/concepts required prior to this learning (may be a scope and sequence across grades/courses)

Guide	0	1	2	3
Math Instructional Guide, Kindergarten	X			
Math Instructional Guide, 1st	X			
Math Instructional Guide, 2nd	X			
Math Instructional Guide, 3rd	X			
Math Instructional Guide, 4th	X			
Math Instructional Guide, 5th	X			
Mathematics, 6th	X			
Mathematics, 7th	X			
Mathematics, 8th	X			
Algebra I (semester 1)	X			
Algebra I (semester 2)	X			
"Double Period Algebra" (support class)	X			
Algebra II	X			
Algebra II with Analysis	X			
AP Calculus	X			
AP Statistics	X			
Calculus with Applications	X			
Consumer Mathematics	X			
Geometry	X			
Introduction to Statistics	X			
Investigations into Mathematics	X			
MAPS 1	X			
MAPS 2	X			
Pre-Calculus	X			
Pre-Calculus with Analysis	X			
Principles of Geometry and Algebra	X			
Statistics and Mathematical Modeling	X			

Criterion three is the weakest area (0) and represents the absence of a scope and sequence across grades or courses that provides direction to teachers in whether they are to introduce the topic, develop the topic, or master the topic with their students. No mention of required skills was addressed within any of the mathematics guides.

Overall, there was no reference to the prerequisite skills, concepts, or experiences needed prior to the learning of guide objectives in order merit awarding the guides a score.

Criterion 4: Delineation of Major Instructional Tools

Exhibit 5.7 shows the ranking of the fourth criterion, delineation of the major instructional tools, with the value rating for each of the subject area guides:

Exhibit 5.7
Delineation of Major Instructional Tools
Montgomery County Public Schools
June 2000

Value/Criteria:

0. No mention of textbook or instructional tools
1. Names the basic text/instructional resource(s)
2. Names the basic text/instructional resource(s) and supplementary materials to be used
3. States for each objective the "match" between the basic text/instructional resource(s) and curriculum objective

Guide	0	1	2	3
Math Instructional Guide, Kindergarten			X	
Math Instructional Guide, 1st			X	
Math Instructional Guide, 2nd			X	
Math Instructional Guide, 3rd			X	
Math Instructional Guide, 4th			X	
Math Instructional Guide, 5th			X	
Mathematics, 6th			X	
Mathematics, 7th			X	
Mathematics, 8th			X	
Algebra I (semester 1)				X
Algebra I (semester 2)				X
"Double Period Algebra" (support class)			X	
Algebra II				X
Algebra II with Analysis				X
AP Calculus				X
AP Statistics			X	
Calculus with Applications				X
Consumer Mathematics			X	
Geometry				X
Introduction to Statistics	X			
Investigations into Mathematics			X	
MAPS 1			X	
MAPS 2			X	
Pre-Calculus			X	
Pre-Calculus with Analysis			X	
Principles of Geometry and Algebra			X	
Statistics and Mathematical Modeling			X	

The fourth criterion calls for each objective within the curriculum to make reference to the location of the objective within the textbook, as well as specific instructional resources that can be used to teach the objective (3). Overall, most of the guides matched the textbooks used within the district and other instructional resources objective by objective.

Criterion 5: Clear Linkages for Classroom Utilization

Exhibit 5.8 shows the ranking of the fifth criterion, clear linkages (strategies) for classroom use, with the value rating for each of the subject area guides:

Exhibit 5.8
Clear Linkages (Strategies) for Classroom Use
Montgomery County Public Schools
June 2000

Value/Criteria:
0. No linkages cited for classroom use
1. Overall, vague statement on linkage for approaching subject
2. Provides general suggestions on approach
3. Provides specific examples on how to approach key concepts/skills in the classroom

Guide	0	1	2	3
Math Instructional Guide, Kindergarten			X	
Math Instructional Guide, 1st			X	
Math Instructional Guide, 2nd			X	
Math Instructional Guide, 3rd			X	
Math Instructional Guide, 4th			X	
Math Instructional Guide, 5th			X	
Mathematics, 6th		X		
Mathematics, 7th		X		
Mathematics, 8th		X		
Algebra I (semester 1)				X
Algebra I (semester 2)				X
"Double Period Algebra" (support class)		X		
Algebra II				X
Algebra II with Analysis				X
AP Calculus				X
AP Statistics				X
Calculus with Applications				X
Consumer Mathematics				X
Geometry				X
Introduction to Statistics	X			
Investigations into Mathematics				X
MAPS 1				X
MAPS 2				X
Pre-Calculus				X
Pre-Calculus with Analysis				X
Principles of Geometry and Algebra				X
Statistics and Mathematical Modeling				X

Under criterion five, the auditors expected to find specific strategies for approaching key concepts and skills in the subject guides. Overall, the auditors found guides that provided specific "cues" for teachers as to how to approach key components within the guide. These "key" components were methods, content selection or subject matter, use of materials or manipulatives, and classroom environment directive or suggestive, etc. While the elementary guides provided some "cues" for teachers, they were not as specific or thorough as their secondary counterparts.

In summary, the mathematics guides were rated inadequate in providing adequate direction and support to focus instruction. No guide was rated over eleven on the fifteen-point scale; the average score was 9.29. The current guides do not contain enough information to provide teachers with a complete work plan to direct their teaching. This inadequacy results in inconsistent use by teachers of the current curriculum guides, and prevents connectivity and articulation across grade levels and with other programs.

Additional Analysis

The auditors performed an additional analysis of the documents presented to determine the degree of internal consistency, monitoring of the written curriculum, alignment, and technology integration provided within the curriculum guides. Auditors also examined the guides for evidence of best practice, authenticity, and a multi-disciplinary approach, among as well as the components of the fundamental theorems of arithmetic, algebra, and calculus within guide objectives, activities, resources, and assessment. This analysis follows:

1. **Internal Consistency**: The format between the elementary and secondary guides (kindergarten through twelfth grade) was not consistent to facilitate alignment between the grades. Guides did not all consistently include linkage to a common assessment, statements of prerequisite skills, specified resources, and suggested teaching strategies. The magnitude of information included in the curriculum from the district and state and the ensuing inability to focus and connect successively all pertinent information into a single format for all grade levels makes it difficult to achieve consistency between the elementary and the secondary grades.

   Additionally, there was no consistency of mathematical strands, nor similarity of concepts between the elementary and secondary grades. An algebra strand was missing from the elementary grades, yet algebra was a major focus for the district (see Finding 6).

2. **Monitoring**: The auditors identified system-wide uncertainty about who is responsible for overseeing and monitoring curriculum delivery (see Finding 8). Several teachers indicated that they thought the principal was responsible for making sure the curriculum was taught, but teachers felt there were so many other duties they had to accomplish that it was often an impossible task. Administrators spoke of how principals attempted to keep up with what is being taught, but all mentioned impediments to successful monitoring because of the lack of clarity as to whether to focus on the Instructional System in Mathematics (ISM), the state learner outcomes, the CRT, or core learning goals. Furthermore, few reflected that they possessed knowledge of methods to supervise the written curriculum. Responses focused mainly on teaching, not curriculum implementation.

   Overall, the scope of mathematics curriculum content frustrated many in their ability to focus, connect, and monitor mathematical concepts across, as well as within the grades. In addition, policies and job descriptions did not provide adequate direction regarding the principal's role in monitoring the implementation of the curriculum.

3. **Vertical Articulation**: In the review of written curriculum guides, there was no evidence of a planned articulation of objectives from one grade to the next within the mathematics subject area (see Finding 6). No scope and sequence flow chart was provided that demonstrated alignment of courses from one grade level to the next. There was no attempt to spiral the content within the mathematics strands from one level to the next. Additionally, the Maryland Learner Outcomes (MLO) were not clearly marked nor aligned to objectives in grades K-8.

4. **Technology Integration**: The curriculum for technology integration within the guides is minimal. Currently, technology use is limited to distributive practice of mathematical skills.

   Overall, the auditors noted very few examples of technology embedded into curriculum guide activities. Additionally, some campuses had ample access to technology (i.e., calculators), and some had little access (see Finding 12).

   Because technology is playing an increasingly important role in mathematics education as well as serve as a valuable tool in helping students understand mathematical concepts, the auditors noted little evidence of any exploration by staff as to how technology can be used most effectively in mathematics courses. In addition, there was no apparent support provided to teachers to help them make appropriate use of technology.

5. **Level of Best Practice, Authenticity, and Multi-disciplinary Approach Among**:

a) **Objectives:** While the Instructional System in Mathematics (ISM) objectives addressed the CRT targets, they often failed to address specific targets from the Maryland School Performance Assessment Program (MSPAP). Overall, the number of objectives from the ISM, MSPAP, and Functional Tests produced an overwhelming number of items for teachers to address within their periods of instruction.

The auditors also examined the course objectives to see if the components of the fundamental theorems of arithmetic, algebra, and calculus were present in the development of strands within each grade level or course. The fundamental theorems are stated in Exhibit 5.9:

Exhibit 5.9
Fundamental Theorems of Arithmetic, Algebra, and Calculus
Montgomery County Public Schools
June 2000

Subject	Theorem
Arithmetic	Every natural number is either prime or can be uniquely factored as a product of primes.
Algebra	Every polynomial equation having complex coefficients and degree ≥1 has at least one complex root.
Calculus	**Version 1 (area as a function of rate)** Define: $F(t) = \int_a f(x)dx$ where f(x) is a continuous function. (This assumption can be weakened.) In other words, F(t) is simply the area under the f(x) curve from a to t. The Fundamental Theorem of Calculus states: $F'(t) = f(t)$ There is an analogous result for indefinite integrals. Let: $F(t) = \int f(t)dt$ Then: $F'(t) = f(t)$ **Version 2 (rate as a function of area)** The second version of the Fundamental Theorem of Calculus states that: $F(t) = F(a) + \int_a F'(x)dx$ This last formula can also be expressed in terms of an indefinite integral: $F(t) = \int F'(t)dt + C$ where C is a constant.

Noting the importance of the development of the fundamental theorems in order for students to move forward in their acquisition of the basic tenets of arithmetic, algebra, and calculus, the auditors examined the following questions in regards to guide objectives and activities:

- Are the components of each theorem present within the guide objectives?
- Are there opportunities (expressed within the guide objectives and ensuing problems and activities) that permit students with the opportunity to synthesize the components of the theorem? (i.e., instead of find the area of a rectangle...say, find the area of an irregular

region? This extension moves the student past knowledge and comprehension to an understanding of the mathematical concept of accumulation).

- Do the guides provide problems and activities that mature students toward an understanding of the fundamental theorems?

In examining the guide objectives, the auditors found that many of the guides inadequately address the components of the fundamental theorems, and do not suggest activities that facilitate the comprehension, application, and synthesis of the theorems and their components. Exhibit 5.10 provides an analysis of the guide objectives within each strand and their success in addressing the fundamental components of the theorems:

Exhibit 5.10
Guide Objectives within Strands that Address Components of the Fundamental Theorems
Montgomery County Public Schools
June 2000

	Theorem of Arithmetic		Theorem of Algebra		Theorem of Calculus	
Course and Strand Activities	Present	Not Present	Present	Not Present	Present	Not Present
Kindergarten						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X
Numeration	X		X			X
Measurement	X		X			X
1st Grade						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X
Numeration	X		X			X
Measurement	X		X			X
2nd Grade						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X
Numeration	X		X			X
Measurement	X		X			X
3rd Grade						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X
Numeration	X		X			X
Measurement	X		X			X
4th Grade						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X
Numeration	X		X			X
Measurement	X		X			X
5th Grade						
Algebra	X		X			X
Geometry		X		X		X
Probability		X		X		X

Exhibit 5.10 (continued)
Guide Objectives within Strands that Address Components of the Fundamental Theorems
Montgomery County Public Schools
June 2000

Course and Strand Activities	Theorem of Arithmetic		Theorem of Algebra		Theorem of Calculus	
	Present	Not Present	Present	Not Present	Present	Not Present
Numeration	X		X			X
Measurement	X		X			X
6th Grade						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	
7th Grade						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	
8th Grade						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	
Algebra I						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	
Geometry						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	
Algebra II						
Algebra	X		X		X	
Geometry	X		X		X	
Probability	X		X		X	
Numeration	X		X		X	
Measurement	X		X		X	

Exhibit 5.10 indicates the following:

Elementary guide objectives that addressed the components that underlie the teaching of arithmetic (i.e., every number can be broken down as a product of its prime) were present in objectives related to numeration, algebra, and measurement.

Elementary guide objectives that addressed the components that underlie the teaching of arithmetic (i.e., every number can be broken down as a product of its prime) were not present in objectives related to geometry and probability.

Secondary guide objectives that addressed the components that underlie the teaching of arithmetic (i.e., every number can be broken down as a product of its prime) were present in objectives related to algebra, geometry, probability, numeration, and measurement.

Elementary and secondary guide objectives that addressed the components that underlie the teaching of algebra (i.e., every polynomial can be broken up in a unique product of monomials) were present in guide objectives, K – 12.

Elementary and secondary guide objectives that addressed the components that underlie the teaching of calculus (i.e., rate as a function of area or area as a function of rate) are only embodied within the curriculum guide objectives in grades six through twelve.

b) **Activities:** The auditors assessed the quality of the activities in the guides. If a deeper understanding of the fundamental theorems of arithmetic, algebra, and calculus is to occur, the current curriculum guides must extend the objectives' scope to include all the theorems and their components. The guides then need to provide to teachers adequate problems and activities which enable students to apply and synthesize the important components within the fundamental mathematical theorems.

The auditors examined the activities currently found in the guides, to determine whether they facilitate the application and synthesis of the fundamental theorems of arithmetic, algebra, and calculus. Exhibit 5.11 presents the findings:

Exhibit 5.11
Activities and Problems in Guides that Permit Students
to Synthesize Components of Theorem
Montgomery County Public Schools
June 2000

Course and Strand Activities	Theorem of Arithmetic		Theorem of Algebra		Theorem of Calculus	
	Present	Not Present	Present	Not Present	Present	Not Present
Kindergarten						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
1st Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
2nd Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X

Exhibit 5.11 (continued)
Activities and Problems in Guides that Permit Students
to Synthesize Components of Theorem
Montgomery County Public Schools
June 2000

Course and Strand Activities	Theorem of Arithmetic		Theorem of Algebra		Theorem of Calculus	
	Present	Not Present	Present	Not Present	Present	Not Present
3rd Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
4th Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
5th Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
6th Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
7th Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
8th Grade						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
Algebra I						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X

Exhibit 5.11 (continued)
Activities and Problems in Guides that Permit Students
to Synthesize Components of Theorem
Montgomery County Public Schools
June 2000

Course and Strand Activities	Theorem of Arithmetic		Theorem of Algebra		Theorem of Calculus	
	Present	Not Present	Present	Not Present	Present	Not Present
Geometry						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X
Algebra II						
Algebra		X		X		X
Geometry		X		X		X
Probability		X		X		X
Numeration		X		X		X
Measurement		X		X		X

From Exhibit 5.11, the auditors were able to determine:

- None of the guide problems and activities offered opportunities for children to apply and synthesize the components of the fundamental theorems of arithmetic, algebra, and calculus.

Overall, the components of the fundamental theorems of arithmetic, algebra, and calculus are not present within guide activities and problems. The absence of these concepts does not allow children in the Montgomery County Public Schools mathematics program to develop an adequate understanding of the theorems which represent fundamental concepts in mathematics.

Furthermore, when an understanding of these concepts is absent, one cannot truly accelerate or become prepared for work in higher mathematics. Current efforts within the district to accelerate students are not providing the students with an adequate grasp of these fundamental math concepts; students are not moving toward a more sophisticated reasoning of rate, accumulation, and function, nor of the basic tenets of algebra. Until effective problems and activities are developed within the strands at each grade level and in each mathematics course, students will not be adequately versed in the basic tenets of arithmetic, algebra, and calculus to apply them at the highest levels.

In addition, the auditors examined the quality of the guide activities. Based on the following audit criteria for quality activities, activities within the guides were rated inadequate. Exhibit 5.12 presents the findings of the auditors:

Exhibit 5.12
Quality Activities Analysis and Auditors' Assessment of District Approach
Montgomery County Public Schools
June 2000

Characteristic	Adequate	Inadequate
1. Experiential: uses direct, active, hands-on concrete, engaging experiences.		X
2. Reflective: have learners reflect on experiences and think about what they have learned.		X
3. Authentic: uses content-rich, real ideas, events and materials in purposeful context, useful, usable information.		X
4. Social: uses social interaction and construction sharing that supports individual learning and thought.		X
5. Collaborative: have cooperative learning that allows for developing and learning outside the confines of competition.		X
6. Child-Centered: uses children's own interests, investigates their own questions, empowers the child.		X
7. Cognitive: uses higher-order thinking skills in conjunction with concepts to be understood. Children self-monitor their own thinking.		X
8. Developmental: activities are adjusted for the needs of each child.		X
9. Constructivist: have children recreate knowledge and content to fit their own understanding.		X
10. Psycholinguistic: uses language as the primary tool for learning.		X
11. Challenging: presents genuine challenges, choices, and responsibility for students in their own learning.		X
12. Activity Variety: uses a variety of approaches including but not limited to, thematic studies, collaborative group activities, learning logs, classroom workshops and conferences, learning centers.		X

Overall, the curriculum guides provided teachers with activities which were inadequate, and there was no effort to align activities with the learner outcomes and performance objectives that would facilitate improved student achievement scores on the MSPAP. Guide activities did not provide students with an opportunity to synthesize the components of the fundamental theorems of arithmetic, algebra, and calculus.

c) **Resources:** There was no evidence of a menu of resources for each objective, a variety of resources to meet different styles of learning, various levels of differentiation among the resources, nor any resources that were authentic or based within the community. No resources were recommended which would assist in the synthesis of the components within the fundamental theorems.

d) **Assessments:** Assessment instruments which are authentic, as well as assessments from the Maryland School Performance Assessment Program (MSPAP) were not present. The ISM objectives, which often did not go beyond the knowledge and comprehension levels of Bloom's Taxonomy, were not aligned with the items on the MSPAP.

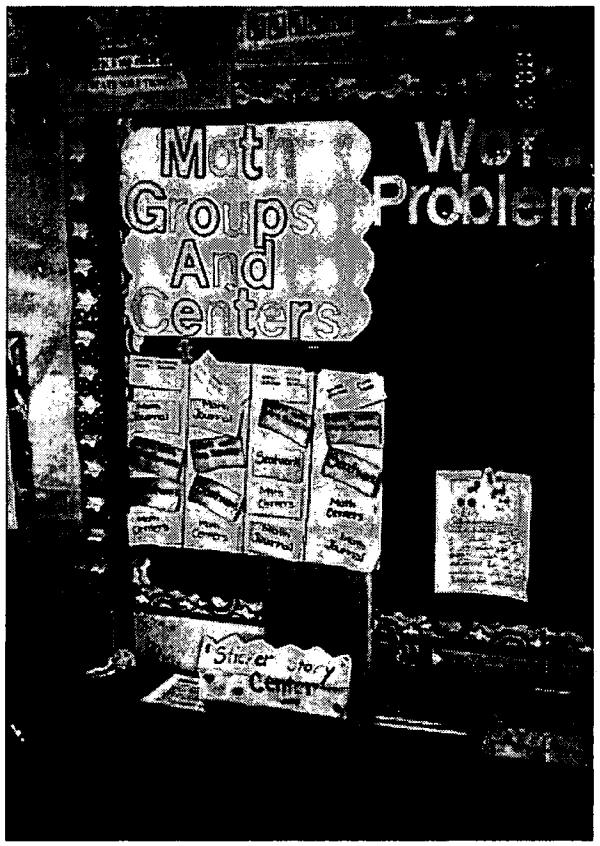
Overall, there was no congruence between objectives and activities and the Maryland learner outcomes. Furthermore, information within the guides about what will be tested was presented in a global context without providing specific clues as to what the testing items address or will look like. Situational examples are not provided.

Little direction is provided within the guides to create congruence between the Maryland learner outcomes and teaching. Furthermore, there was no parallelism between the Maryland learner outcomes and activities in the guides.

Use of Guides

Curriculum guides represent the teachers' handbook of the overall expectations for curriculum design and delivery. Quality guides provide teachers with a clear, instructional focus and direct their efforts in addressing the outcomes evaluated by the Maryland School Performance Assessment Program. When information provided by the State of Maryland is not fully incorporated into the design and delivery of the curriculum, student achievement is impaired, and consistent, district-wide assessment of that curriculum cannot be accomplished.

What occurs in the classroom is either textbook- or teacher-driven rather than guided by objectives that are clear and focused on those learner outcomes that will produce increased student growth and achievement. The lack of consistent direction and focus is often accompanied by disparate student achievement across grade levels, particularly between certain groups (see Findings 3 and 13).



Word Problems in Math

The auditors interviewed teachers and staff about the use of available materials from the district. The auditors expected to find that the curriculum guides were used to guide teachers' instruction. Auditors also expected teachers to be focusing on achievement as measured by the Maryland learner outcomes and clearly defined and outlined in the guides.

The auditors found that the available guides provided inadequate direction for teaching the Maryland learner outcomes, and did not successfully address the outcomes presented in state documents. Individuals indicated that the Maryland Learner Outcomes themselves guided some teachers' teaching; however, others focused on the Instructional System in Mathematics (ISM) objectives. Some stated that teaching the Instructional System in Mathematics (ISM) and CRT objectives would prepare one for the MSPAP, but auditors' observations did not confirm this.

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Overall, there were no individuals interviewed who indicated that any one document was used by all in planning daily lessons. Some of the comments made to the auditors included:

- "Teachers are doing their own thing."
- "Curriculum guides have no meaning whatsoever."
- "We keep adding to the curriculum and teach at a superficial level with no depth."
- "Many elementary teachers teach all the objectives within a strand and then move to the next strand...the guide is rarely used...it is too confusing."
- "There are too many objectives in the Algebra I curriculum...I just teach what I want."
- "Exponential regression is not appropriate for 9th grade...I just delete it...I pick and choose from the curriculum what I feel is needed."
- "We need to take something out of our curriculum...there is no chance to master objectives...I select what my kids need from the curriculum."
- "My curriculum is full of worksheets...we just do one worksheet after the other."
- "The guides are immersed with activities and our kids know very little of anything...they (the guides) have no depth of coverage of the topics."
- "The guides only allow for direct instruction...worksheet after worksheet.... They do not prepare kids for the MSPAP."
- "The ISM, CRT, and MSPAP assessments drive teaching more than the guides."
- "Curriculum is non-existent in my building."
- "No one knows who wrote the curriculum...it does not make sense to everyone."
- "ISM is not a curriculum and it is not effective.... We use the ISM, not the guides."
- "Even after 24 years in this district, I still do not know what to use to direct my teaching."
- "New teachers are confused...they do not understand the ISM or any other documents."
- "I've prepared my own curriculum that I teach...the district's curriculum is bloated."
- "No one has ever explained the focus of the math curriculum."

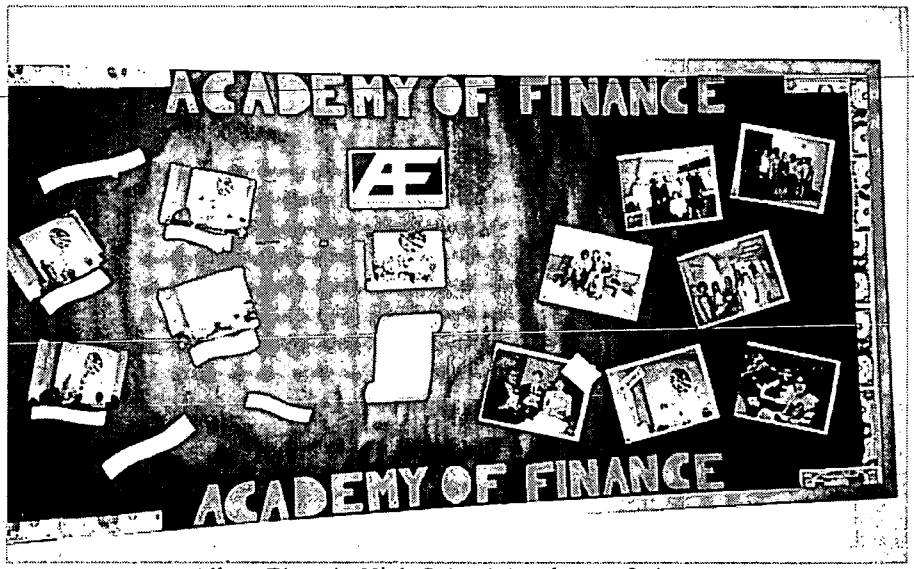
Overall, elementary teachers rarely referred to a guide directing instruction. Certain secondary teachers, however, referred to the curriculum as their "Bible." Without clear, district-wide objectives for student achievement that are followed by teachers at every grade level, the quality and focus of instruction are inconsistent from grade to grade as well as inadequate for teacher direction and support.

Finding 6: Mathematics Curriculum Alignment Is Not Established or Empirically Confirmed.

An effective curriculum in any content area begins with clear guidelines regarding what students should know and be able to do in topics that are considered critical to mastery of the given subject. The guidelines, which can be called by a variety of names—standards, learning outcomes, learning goals, instructional objectives—are generally written in broad terms applicable to all students in the system. In today's educational environment, the guidelines established by a system are recommended to be aligned with national and state standards for the same content area.

Once established, the guidelines provide the framework for an articulated scope and sequence for learning across all grade levels and courses. The scope and sequence that evolves from the established guidelines is the major referent in the selection of instructional materials and the development of assessments to document learning.

The auditors expected to find a set of mathematics standards in Montgomery County that was congruent with the Maryland Learning Outcomes in Grades K-8 and Core Learning Goals for Grades 9-12, and the assessment system based on state expectations (the Maryland School Performance Assessment Program). Because textbooks reflect content and philosophy of national standards, the auditors also expected the Montgomery County mathematics standards to reflect the *Principles and Standards* of the National Council of Teachers of Mathematics (NCTM).



Albert Einstein High School Academy of Finance

To determine the match between Montgomery County objectives in mathematics and those set forth by the State of Maryland and the National Council of Teachers of Mathematics, auditors reviewed all Montgomery County mathematics curriculum documents provided to them, the NCTM's *Principles and Standards,* and Maryland's Learning Outcomes for K-8 and Core Learning Goals for 9-12. Auditors also reviewed one textbook at each of three grade levels—four, seven, and algebra I—to determine the alignment between an approved textbook and the Montgomery County's curriculum at that level.

The auditors found that clearly articulated program standards are not in place for K-12 mathematics in Montgomery County. The content categories found in county curriculum documents are fragmented and not consistent from one level to the next. There is no master document that provides a complete picture of K-12 mathematics in Montgomery County with statements of what is expected of students in various curricular components. In contrast, the content standards from NCTM (K-12) and the Maryland Learning Outcomes (K-8) and Core Learning Goals (9-12) contain descriptions of what students should know and be able to do across five broad areas. A comparison of the relationships of local, state, and national content is shown in Exhibit 6.1.

Exhibit 6.1
Relationships Across NCTM Standards, Maryland Outcomes, and Montgomery County Mathematics Content
Montgomery County Public Schools

NCTM Standards 2000 (K-12)	Maryland Learning Outcomes (K-8) and Core Learning Goals (9-12)	Montgomery County Categories—K-8 Standards—9-12
Number and Operations	MLO (K-8)	K-8 ISM (May 1995)
	Number Relationships	Addition
	Estimation in Measurement/Problem Solving	Common fractions
		Decimal fractions
		Division
		Multiplication
		Numeration

Exhibit 6.1 (continued)
Relationships Across NCTM Standards, Maryland Outcomes, and Montgomery County Mathematics Content
Montgomery County Public Schools

NCTM Standards 2000 (K-12)	Maryland Learning Outcomes (K-8) and Core Learning Goals (9-12)	Montgomery County Categories—K-8 Standards—9-12
		Ratio and percent
		Subtraction
		6-8 Revision (1999)
		Common fractions (Gr. 6)
		Decimal operations (Gr. 6)
		Rational numbers (Gr. 7)
		Proportions and percent (Gr. 7)
		Number relationships (Gr. 8)
Algebra	**MLO (K-8)**	**K-8 ISM (1995)**
	Algebra	Integers and equations
	Patterns and Relationships	Number theory
		6-8 Revision (1999)
		Algebraic concepts (Gr. 6)
		Algebraic relationships (Gr. 7-8)
	CLG (9-12)	**9-12 (1998)**
	Functions and Algebra	Algebra and Patterns
Geometry	**MLO (K-8)**	**K-8 ISM (1995)**
	Geometry	Geometry
		6-8 Revision (1999)
		Geometry and measurement(Gr. 6-7)
		Geometric constructions (Gr. 8)
	CLG (9-12)	**9-12 (1998)**
	Geometry, Measurement and Reasoning	Geometry
Measurement	**MLO (K-8)**	**K-8 ISM (1995)**
	Measurement with Estimation/ Verification	Measurement
		Money
		6-8 Revision (1999)
		Measurement (Gr. 8)
		9-12 (1998)
		Measurement
Data Analysis and Probability	**MLO (K-8)**	**K-8 ISM (1995)**
	Statistics	Statistics and probability
	Probability	**6-8 Revision (1999)**
		Statistics (Gr. 6-7)
		Probability and Odds (Gr. 7)
		Statistics and Probability (Gr. 8)
	CLG (9-12)	**9-12 (1998)**
	Data Analysis and Probability	Data analysis
		Probability

The following observations can be made from the table above:

- NCTM Standards contain five content areas that span grades K-12.
- The Maryland outcomes are broken into two different levels (K-8, 9-12) with some variation in names, but there is a strong match between the state and national outcomes in content and expectations.

- There are many more topics in the Montgomery County curriculum than there are standards/outcomes in the national and state documents.
- All of the county's topics do fit into the more comprehensive categories established by the NCTM and the Maryland Department of Education.
- There are no written statements of what is expected in grades K-8 in Montgomery County; content is listed as a series of topics.
- County standards have been articulated for grades 9-12. Those standards are aligned both in content and expectations with state and national outcomes and standards.
- Middle school topics (revised in 1999) are not consistent across grade levels.

Maryland Learning Outcomes and Core Learning Goals are subdivided into specific indicators of student mastery to be demonstrated on Maryland School Performance Assessment Program (MSPAP) tests. Tests are administered at Grades 3, 5, and 8. End-of-course examinations in algebra and geometry were piloted this year. (Note: Field testing of end-of-course state assessments in algebra 1 and geometry were also administered).

Auditors compared state indicators with mathematics objectives and indicators in Montgomery County curriculum to determine the match between state and county expectations. County curriculum used for analysis included K-5 Instructional System in Mathematics (ISM) objectives, Grades 6-8 indicators revised in 1999, and algebra and geometry indicators developed in 1998. State documents used for comparison were the Core Learning Goals for the high school courses and the Maryland Learning Outcomes that will take effect for the Spring 2002 administration of MSPAP.

The updated Maryland Learning Outcomes were used because those are the outcomes that will guide upcoming curriculum revisions. A summary of these comparisons is provided in Exhibit 6.2.

Exhibit 6.2
Percent of Maryland Objective Covered by Montgomery County Curriculum
Montgomery County Public Schools

Test	Grade Levels or Course	Number of Maryland Objectives (Content Strands)	Number of Montgomery County Objectives	% of Maryland Objectives Covered by Montgomery Co. Curriculum	% of Montgomery County Curriculum Beyond Maryland Objectives
3rd	K-3	31	K—47 1—64 2—87 3—93	81% (See Note 1)	0% (See Note 2)
5th	4-5	37	4—92 5—88	Full—57% Partial—11%	12% (See Note 3)
8th	6-8	32	6—40 7—39 8—28	78%	23% (See Note 4)
Algebra/Data	Algebra	15	65	93%	40%
Geometry	Geometry	9	51	100%	53%

Note 1: Many of the K-3 deficiencies in Montgomery County curriculum are in probability.
Note 2: Montgomery County ISM objectives at K-3 are very small, discrete skills that apply to larger objectives, both at the state level and as preparation for subsequent grades in the County system.
Note 3: Most 4-5 ISM objectives that do not relate to Maryland Learning Outcomes deal with metric measurements; these were "in" when the ISM was originally developed, but customary measurements are more likely to be encountered on state assessments, except in science tasks with metric measurements.
Note 4: Montgomery County curriculum contains odds at 7th grade and extensive geometric constructions at 8th grade and formalized study of number systems at 8th grade.

The following can be noted from the table above:

- The extensive number of objectives at most grade levels substantiates the popular expression that "American curriculum is a mile wide and an inch deep."

- All state objectives in geometry are covered by district curriculum; the algebra/data analysis strands follow closely, with a 93 percent match.
- Coverage of state curricular objectives in courses that precede algebra is not as strong, ranging from a low of 57 percent full coverage for the fifth grade test to 81 percent coverage of objectives for the third grade test.
- Algebra and geometry courses in Montgomery County contain significantly more material than is required by state standards.

In order for students to demonstrate what they know and can do with their knowledge, they must have the opportunity to learn the content (alignment between taught and tested curriculum, as addressed by the material summarized in Exhibit 6.2). In addition, the context of student learning and the ways in which that learning is assessed need to be congruent. Incongruence between the two is evident in Montgomery County. One example is in the area of Instructional System in Mathematics (ISM) objectives, which are very small, discrete skills. Expectations at the state level are for the application of multiple skills in complex situations. Students being assessed throughout the year on small, isolated bits of knowledge are not well prepared for the more complex state assessment. A second example is in algebra, which is taught in Montgomery County as a formal, symbolic course. Functions are introduced very early in the year with formal notation, (i.e. $f(x) = 2x + 3$ rather than $y = 2x + 3$). The use of functional notation continues throughout the year. The formal notation is not required by state standards and is not included in most algebra I textbooks until the end of the year. Montgomery County students accustomed to formal notation will be at a disadvantage on state assessments that do not use less formal but equally valid mathematical notation.

Alignment of written and tested curriculum is addressed above. Complete alignment goes further and includes alignment of written, taught, and tested curriculum. Interviews with teachers, administrators, and district patrons indicate that alignment of the three components is a major concern.

- "Aligning our curriculum is our most important need."
- "We need to align our curriculum with the state standards."
- "We teach 'bits and pieces' of the curriculum."
- "I see a disconnect sometimes between the curriculum and instruction."
- "We do not articulate the curriculum between the grades. The lack of articulation makes it difficult to know what to teach kids when I have to address the MSPAP."
- "We want a much clearer alignment with the State; the State is our master."
- "Teachers are recreating their own curriculum."
- "Teachers use the curriculum (ISM), but they change the order."
- "Elementary schools feel strongly that classroom assessments (same as 1989) are not preparing students for Maryland assessments."

The written curriculum with a sound scope and sequence provides teachers with the necessary road map for determining which objectives are to be taught in each grade level or course. When teachers and administrators were asked how teachers decide what to teach, the overwhelming response was "the county curriculum." A textbook that has been carefully selected to match the written curriculum at a particular grade level provides both teachers and students with an invaluable resource for teaching and learning. A wide range of textbooks has been approved for use in Montgomery County (see Finding 12). One text at each of three different levels was selected for an in-depth analysis of the correlation between the text and the district curriculum. Results of that analysis are summarized in Exhibit 6.3.

Exhibit 6.3
Coverage of Montgomery County Curriculum by Selected Texts at Selected Grade Levels
Montgomery County Public Schools

Grade or Course with Source of Objectives	Number of Objectives	Text Reviewed	Percent of Objectives in Text
Grade 4 (Current ISM objectives)	92	*Math*, Grade 4, Scott Foresman-Addison Wesley, © 1999	85%
Grade 7 (1999 objectives revision)	39	*Mathematics, Applications and Connections,* Glencoe, © 1999	Full coverage - 72% Partial coverage - 7%
Algebra I (1998 course revision)	65	Algebra I, An Integrated Approach, D. C. Heath, ©1995	89%

It can be noted from Exhibit 6.3 that none of the textbooks reviewed include all the curricular objectives at that grade level so that supplemental materials would need to be developed to cover the entire mathematics curriculum. Not evident in the table is the difference in sequencing that makes it very difficult for Montgomery County teachers to use textbooks efficiently.

While textbooks have a major focus for each chapter, the same content may be revisited several times throughout the book, spiraling to a higher level each time it appears. For example, problem sets throughout each textbook include review problems that address concepts studied earlier in the year; the value of this type of distributed practice has been established through learning theory research.

Curriculum development in Montgomery County has followed a unit approach, with all the learning related to a particular topic concentrated in that unit. A November 3, 1999 memo from the Coordinator of Secondary Mathematics to the Members of the Council on Instruction related to revision of the middle school mathematics curriculum included this statement, "A decision was made to group indicators by topical unit to make them more cohesively grouped and connected, and to enable students to spend more time understanding, making connections, and applying the concepts introduced." This practice is apparent in the algebra I curriculum as well, which contains ten non-overlapping units. The fourth grade curriculum guide, which dates back to 1991, is made up of thematic units with no textbook correlations. The rationale for the approach is provided in the quote above. The downside of the approach is two-fold: the difficulty of using a textbook as an instructional tool, and the absence of distributed practice. A frequent comment from teachers and administrators related to Instructional System in Mathematics (ISM) testing was that students don't carry over their knowledge after demonstrating initial learning; this is a direct consequence of the lack of systematic practice with and application of previously learned material throughout the year and beyond. The K-12 mathematics guides do not adequately integrate and spiral discrete concepts.

The assessment options available to teachers and students were reviewed for all three textbooks. All textbooks contain multiple-choice questions, short answer problems, questions that require writing and justification for mathematical problem solving, and performance assessments. These are the types of items found on both Maryland assessments and the criterion-referenced assessments given to Montgomery County students at the end of each grade or course, and these items provide the ongoing practice needed by students to be successful on the high-stakes examinations.

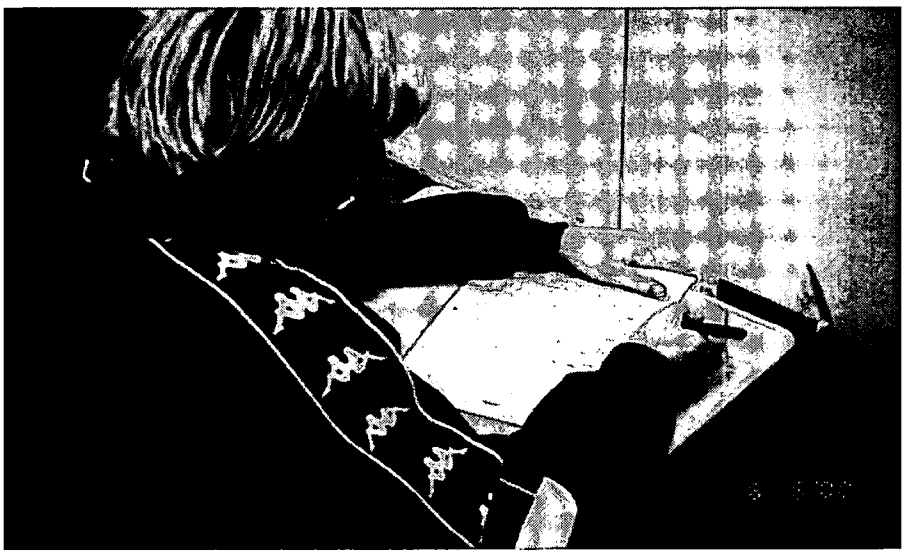
In summary, auditors found that well-articulated, K-12 curriculum standards are not in place in Montgomery County. Alignment of county and state mathematics indicators ranges between 57 percent and 100 percent. The sequencing of instruction by discrete units makes it difficult to select instructional materials that are easy to use even though content may be appropriate as the sequencing of concepts in the materials is not the same as that of the units.

Finding 7: Mathematics Testing and Assessment Are Adequate in Scope, But Ineffective in Implementation. Overall Achievement Trends Are Positive, But Not All Students Are Experiencing Equal Success in Mathematics.

A comprehensive student testing program provides a foundation on which to base decisions regarding curriculum design and delivery. The district's plan for assessment of student achievement is a vehicle for examining how well programs are actually producing desired learning results. The assessment program also provides feedback to the teaching staff regarding how classroom instruction can be more effective, and provides data by which the staff can compare the strengths and weaknesses of various programs and program alternatives.

School districts can make better decisions about curriculum and instruction when the system has the availability of comprehensive student achievement data. An effective testing program requires that the means of assessment be directly related to major learning objectives in every course of study at every grade level. Lacking such information, the Board and educational leaders have only anecdotal and random evidence concerning the central components of schooling, teachers have no reliable measures of student learning, and parents and students are uncertain about the extent of student learning.

The auditors reviewed the extent to which the curriculum areas being taught were also being tested. The auditors acquired information on the testing program required by the district and the state. In addition, curriculum guides were reviewed to determine whether they contained assessment requirements linked to performance objectives.



Winston Churchill High School Test Taking Time

The required testing program in the Montgomery County Public Schools consists of the administration of the following tests:

- Early Childhood Assessment Program, district-mandated assessments administered to second grade students in language arts and mathematics.
- Instructional System in Mathematics (ISM) assessments, which are administered at grades K - 8 as a part of the instructional monitoring of curriculum mastery.
- Montgomery County Criterion-referenced Tests, district-mandated assessments administered at grades 3 - 8.

- Maryland School Performance Assessment Program (MSPAP), a state-mandated performance assessment administered at grades 3, 5, and 8 in reading, language usage, writing, mathematics, social studies, and science.
- Comprehensive Tests of Basic Skills, version five, a state-mandated test administered at grades 2, 4, and 6 in reading, mathematics, and language.
- Maryland Functional Tests, state-mandated competency tests which are first administered at grade 7 until passed. Tests are administered in mathematics, reading, and writing.
- An algebra I semester test administered to students that take that course.
- A geometry semester test administered to students that take that course.
- Advanced Placement Examinations are available as optional assessments for students who have enrolled in high school advanced placement courses.

Other tests administered on an optional basis at the senior high school level include:

- Preliminary Scholastic Aptitude Test (PSAT) is administered to students in grade 10. The test measures verbal and mathematical reasoning and is used to help students prepare for the SAT, enter scholarship competitions, seek information from colleges, and get feedback about verbal and mathematical reasoning achievement.
- Scholastic Assessment Test (SAT) is designed to measure verbal and mathematical reasoning abilities. Eleventh and 12th grade students are encouraged to take the SAT.

The configuration for formal student testing in Montgomery County Public Schools is shown in Exhibit 7.1.

Exhibit 7.1
Matrix of Student Tests Administered
Montgomery County Public Schools
School Year Ending 1998

Assessment	K	1	2	3	4	5	6	7	8	9	10	11	12
Early Childhood Assessment Program			D										
ISM	D	D	D	D	D	D	D	D	D				
Montgomery Co. Criterion-referenced Tests				D	D	D	D	D	D				
Comprehensive Tests of Basic Skills			X		X		X						
Maryland School Performance Assessment Program				X		X			X				
Maryland Functional Tests								X	X	X	X	X	X
Algebra I End-of-Semester Exam								D	D	D	D	D	D
Geometry End-of-Semester Exam									D	D	D	D	D
Preliminary SAT											O		
Advanced Placement												O	O
SAT												O	O

D - District-mandated assessments; O - Optional assessments; X - State-mandated assessments

As noted in the exhibit, there are 27 district-required tests in addition to 12 state-mandated tests:

- The state-mandated tests are the Maryland School Performance Assessment Program (MSPAP), the Comprehensive Tests of Basic Skills, and the Maryland Functional Tests;
- The district administers the Early Childhood Assessment Programs tests, the Instructional System in Mathematics (ISM), Montgomery County Criterion-referenced Tests, algebra I, and geometry tests;
- The district encourages students to take the PSAT (grade 10) and SAT (11 and 12); and
- Students enrolled in Advanced Placement courses are encouraged to take the Advanced Placement examination parallel to the course taken.

To determine the scope of the student assessment program, the auditors examined all test data presented to them as the totality of system-wide assessment data used in the district. This information was then analyzed by the mathematics course offered at each grade level to determine which mathematics courses offered were actually formally assessed. The information on mathematics courses and grade levels tested was entered into a matrix to provide information on the scope of the district's formal assessment program. The matrix lists all the mathematics courses taught in the district. The auditors then calculated the percentage of courses/grade levels that are formally assessed compared with those courses which are not. An adequate student testing program would assess minimally 70 percent of all mathematics subjects studied by students.

The extent to which each mathematics subject area taught in the district is formally assessed is depicted in Exhibit 7.2.

Exhibit 7.2
Matrix of Formal Testing Administered
Grades K-12 by Discipline Area
Montgomery County Public Schools
School Year Ending 1998

	Grades											
Assessment	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Grade 1 Mathematics	I											
Grade 2 Mathematics		E 5										
Grade 3 Mathematics			I M C									
Grade 4 Mathematics				I C 5 Go								
Grade 5 Mathematics					I M C							
Grade 6 Mathematics						I C 5 Go						
Grade 7 Mathematics							I C F					
Grade 8 Mathematics								I C M F				
Mathematical Approach to Problem Solving 1 A									F			
Mathematical Approach to Problem Solving 1 B									F			
Mathematical Approach to Problem Solving 2 A									F			
Mathematical Approach to Problem Solving 2 B									F			
Related Math A									F	F	F	F
Related Math B									F	F	F	F
Algebra 1 A							A F	A F	AF	A P F	A S F	A S F
Algebra 1 B							A	A	A	A P F	A S F	A S F
Geometry A								G F	GF	G F P	G S F	G S F
Geometry B								G F	GF	G F P	G S F	G S F
Geometry A (Honors)									GF			
Geometry B (Honors)									GF			
Principles of Geometry and Algebra A										F P	F S	F S

Exhibit 7.2 (continued)
Matrix of Formal Testing Administered
Grades K-12 by Discipline Area
Montgomery County Public Schools
School Year Ending 1998

Assessment	Grades 1	2	3	4	5	6	7	8	9	10	11	12
Principles of Geometry and Algebra B										F P	F S	F S
Consumer Math A											F S	F S
Consumer Math B											F S	F S
Business Math A											F S	F S
Business Math B											F S	F S
Algebra II A									2 F	2 F	2 S F	2 S F
Algebra II B									2 F	2 F	2 S F	2 S F
Algebra II/Analysis A (Honors)										2 F P		
Algebra II/Analysis B (Honors)										2 F P		
Pre-Calculus A											F S	F S
Pre-Calculus B											F S	F S
Calculus A (AP Class)											AP S F	AP S F
Calculus B (AP)											AP S F	AP S F
Calculus with Applications A (Honors)											AP S F	AP S F
Calculus with Applications B (Honors)											AP S F	AP S F
Stat and Mathematical Modeling A											F S	F S
Stat and Mathematical Modeling B											F S	F S
AP Statistics A											AP S F	AP S F
AP Statistics B											AP S F	AP S F

Key: 2=Algebra II End-of-Course Test; 5=CTBS/5; A=Algebra I End-of-Course Test;
AP=Advanced Placement Tests; C=Curriculum-based Assessments;
E=Early Childhood Assessment Program; F=Maryland Functional Mathematics Test;
G=Geometry End-of-Course Test; Go=Goals Mathematics Assessments; I=ISM Assessments;
M=MSPAP; P=PSAT; S=SAT/ACT

As can be noted in the exhibit:

- Of the 93 grade/subject areas where testing could have actually occurred, testing took place in 93 areas.
- Testing can occur in all mathematics courses (100 percent); however, in six of the courses, the assessment is the Maryland Functional Test which may have been passed prior to grade 9 when courses such as mathematical approach to problem solving and related math are being taught. Thus, for some students, there is no assessment in 12 of 93 high school courses (87 percent actual scope coverage).

These analyses indicate that the Montgomery County Public Schools student assessment program is adequate in scope (87 percent observed scope > 70 percent required scope). From this exhibit, it is clear that the district formally assesses student mathematics achievement.

In summary, student assessment information was adequate in scope to allow for formal evaluation of the comprehensive educational efforts of Montgomery County Public Schools. The majority of the mathematics curriculum is included in the district's student assessment program. The Board, educators, students, and their parents do have adequate sources of information which they need to assess the quality of mathematics schooling in the Montgomery County Public Schools.

Student Achievement Trends

Comparative student assessment data enable the Board, educational community, parents, students, and others to assess how well the school systems' students are performing when compared to students across the nation, state, or other school districts. Most importantly, the comparative assessment data allow educators to determine how well district students perform over the short- and long-term. Effective school districts and schools use comparative data from student assessment instrument to identify areas of the educational program which need improvement.

In a productive school district, one would expect to see improvement over time in student performance on various student assessment instruments, and a reduction of any performance gaps that might exist. Another expectation is that, over time, the achievement of students would be better than the predicted level of achievement based on student demographics. (Limited variation in performance across time may reflect stagnation, even when student achievement is high). The auditors reviewed test data summaries and reports provided by Montgomery County Public Schools. The review included:

- Five years of Maryland School Performance Assessment Program data overall for the school district and by school for grades 3, 5, and 8, compared with state mean performance.
- Three years of student performance on GOALS mathematics performance assessments embedded in the Montgomery County Criterion-referenced assessments at grades 4 and 6.
- One year of student performance on the multiple-choice and open-ended components of the Montgomery County Criterion-referenced assessments in mathematics at grades 3 – 8.
- Two years of Comprehensive Tests of Basic Skills, 5th edition (CTBS/5) test data for grades 2, 4, and 6 in mathematics and mathematics computation with comparison data for the state and nation.
- Two years of data on the percentage of students passing the Maryland Functional Mathematics Tests (1998 and 1999) at the middle and high school levels.
- One year of data on student Mark Distributions on the district developed algebra 1 and geometry 1 final exams as of August 1999.
- One year of comparative student data on the Advanced Placement calculus and statistics tests.
- Four years of comparative PSAT data.
- Five years of comparative SAT results for 12th grade students.

Overall, the auditors found that the long-term achievement trend for the Montgomery County Public Schools was positive, mostly exceeding state and national norms. However, there were fluctuations in performance for grade level cohorts from year to year. A review of available assessment data showed large variations in performance among schools within the district when such data was disaggregated. Student performance on Advanced Placement, PSAT, and SAT examinations was higher than the national average.

Maryland School Performance Assessment Program (MSPAP) Results

The MSPAP is a state-mandated performance assessment administered to students in grades 3, 5, and 8. The MSPAP assesses students' performance in reading, language usage, writing, mathematics,

social studies, and science. Data are reported in terms of the percentage of students achieving mastery of content. The targets are: satisfactory (70 percent of students achieving proficiency) and excellent (95 percent achieving proficiency).

Exhibit 7.3 summarizes the percentage of students achieving the satisfactory level of performance on the MSPAP from 1995 through 1999.

Exhibit 7.3
Performance of Grade 3 Students
Compared with State Performance on the MSPAP
Montgomery County Public Schools

Performance	Year	Math
Maryland	1999	38.9
Montgomery County Public Schools	1999	52.1
Maryland	1998	41.6
Montgomery County Public Schools	1998	55.6
Maryland	1997	41.4
Montgomery County Public Schools	1997	55.5
Maryland	1996	38.7
Montgomery County Public Schools	1996	52.4
Maryland	1995	41.6
Montgomery County Public Schools	1995	56.4

As noted in Exhibit 7.3:

- The average performance of Montgomery County Public Schools third grade students was above the state average in mathematics across all five years reviewed.
- Although above the state average, overall performance of Montgomery County Public Schools students declined from 56.4 percent of students achieving proficiency in 1995 to 52.1 percent in 1999.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Exhibit 7.4 summarizes the percentage of fifth grade students achieving at the satisfactory level of performance on the MSPAP from 1995 through 1999.

Exhibit 7.4
Performance of Grade 5 Students
Compared with State Performance on the MSPAP
Montgomery County Public Schools

Performance	Year	Math
Maryland	1999	46.2
Montgomery County Public Schools	1999	61.2
Maryland	1998	47.9
Montgomery County Public Schools	1998	61.9
Maryland	1997	48.2
Montgomery County Public Schools	1997	63.2
Maryland	1996	47.8
Montgomery County Public Schools	1996	61.1
Maryland	1995	44.7
Montgomery County Public Schools	1995	59.6

As noted in Exhibit 7.4:

- The average performance of Montgomery County Public Schools fifth grade students was above the state average in mathematics across all five years reviewed.
- Overall performance of Montgomery County Public Schools students declined from 63.2 percent of students achieving proficiency in 1997 to 61.2 percent in 1999.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Exhibit 7.5 summarizes the percentage of eighth grade students achieving the satisfactory level of performance on the MSPAP from 1995 through 1999.

Exhibit 7.5
Performance of Grade 8 Students
Compared with State Performance on the MSPAP
Montgomery County Public Schools

Performance	Year	Math
Maryland	1999	49.0
Montgomery County Public Schools	1999	66.1
Maryland	1998	47.4
Montgomery County Public Schools	1998	64.3
Maryland	1997	45.9
Montgomery County Public Schools	1997	63.4
Maryland	1996	43.3
Montgomery County Public Schools	1996	57.7
Maryland	1995	42.3
Montgomery County Public Schools	1995	58.8

As noted in Exhibit 7.5:

- The average performance of Montgomery County Public Schools eighth grade students was above the state average in mathematics across all five years reviewed.
- Overall performance of Montgomery County Public Schools students rose from 58.8 percent of students achieving proficiency in 1995 to 66.1 percent in 1999.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Exhibit 7.6 summarizes the percentage of third grade students achieving the satisfactory level of performance on the mathematics section of the MSPAP from 1995 through 1999 by school.

Exhibit 7.6
Performance of Third Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 to 1999

Performance	1999	1998	1997	1996	1995
Maryland	38.9	41.6	41.4	38.7	42.0
Montgomery County Public Schools	52.1	55.6	55.5	52.4	56.4
Ashburton	80.9	77.3	82.1	64.8	74.1
Bannockburn	65.6	75.5	72.3	62.5	76.1
Barnsley	54.9	46.8	52.9	53.8	54.1
Beall	51.6	52.8	42.7	40.0	41.5
Bells Mill	70.0	77.8	77.9	54.0	88.7
Belmont	74.2	63.4	59.5	67.1	62.2
Bethesda	72.6	65.2	76.8	58.1	69.2

Exhibit 7.6 (continued)
Performance of Third Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 to 1999

Performance	1999	1998	1997	1996	1995
Beverly Farms	78.9	80.6	75.8	67.1	87.3
Bradley Hills	72.0	79.6	73.9	74.1	57.8
Broad Acres	18.0	21.7	22.4	13.6	17.0
Brooke Grove	55.7	76.5	58.6	55.7	54.6
Brookhaven	35.0	37.5	23.2	27.7	44.7
Brown Station	34.3	34.7	46.5	40.3	49.1
Burning Tree	74.7	94.1	79.7	82.9	88.0
Burnt Mills	30.9	26.8	25.6	32.9	46.1
Burtonsville	35.3	38.0	47.2	50.4	49.5
Candlewood	48.1	44.6	59.2	56.8	61.6
Cannon Road	42.1	55.1	48.0	37.0	53.6
Carderock Springs	87.3	84.1	91.1	78.7	81.5
Rachel Carson	61.0	59.1	47.9	59.0	46.3
Cashell	63.0	71.4	53.3	61.3	67.9
Cedar Grove	83.6	73.2	83.6	76.3	81.3
Chevy Chase	77.2	70.8	85.7	73.7	83.0
Clarksburg	60.4	63.3	67.6	56.3	77.3
Clearspring	51.6	44.4	56.8	46.8	53.8
Clopper Mill	35.2	36.3	45.8	34.7	42.9
Cloverly	60.8	71.3	55.1	48.8	51.5
Cold Spring	80.0	97.0	82.2	93.8	95.8
College Gardens	66.2	62.2	64.5	41.5	55.3
Cresthaven	51.8	42.5	38.1	44.3	35.1
Capt James E. Daly	54.5	40.6	43.2	39.7	54.0
Damascus	72.4	68.6	69.6	54.3	73.7
Darnestown	83.6	84.0	73.5	68.1	69.0
Diamond	49.4	61.6	58.1	68.2	66.1
Charles Drew	46.2	57.4	56.3	54.0	40.8
Dufief	70.3	83.3	89.7	75.4	85.0
East Silver Spring	36.2	43.5	35.1	30.5	43.0
Fairland	31.1	33.3	52.0	40.5	54.7
Fallsmead	82.7	66.7	73.0	81.3	75.4
Farmland	72.2	74.7	86.4	76.8	74.2
Fields Road	64.9	71.2	54.5	69.1	59.7
Flower Hill	56.4	50.6	53.2	55.9	59.3
Flower Valley	57.4	65.9	63.8	58.5	65.9
Forest Knolls	46.7	48.9	52.1	60.0	50.9
Fox Chapel	51.9	32.3	38.9	42.6	46.0
Gaithersburg	28.2	35.7	32.6	58.3	49.4
Galway	15.5	33.9	35.8	36.4	37.7
Garrett Park	80.3	83.1	75.6	71.2	75.7
Georgian Forest	55.6	45.5	44.9	37.7	49.1
Germantown	62.7	54.4	59.7	56.4	62.5
Glen Haven	32.4	36.7	22.5	30.4	38.7
Glenallan	40.6	28.6	40.5	43.1	34.3
Goshen	74.7	69.4	72.2	52.9	65.2

Exhibit 7.6 (continued)
Performance of Third Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 to 1999

Performance	1999	1998	1997	1996	1995
Greencastle	33.6	40.6	31.5	33.3	38.6
Greenwood	63.3	59.6	76.9	56.9	54.4
Harmony Hills	27.5	34.5	64.0	47.4	30.6
Highland	15.4	29.2	31.4	19.7	27.3
Highland View	55.7	44.4	32.4	44.1	70.6
Jackson Road	35.4	41.6	41.2	46.2	47.5
Jones Lane	72.2	82.6	71.4	68.5	66.1
Kemp Mill	43.4	38.2	31.3	50.5	37.5
Kensington-Parkwood	100.0	53.4	51.1	56.3	58.2
Lake Seneca	54.4	60.3	50.0	54.1	83.3
Lakewood	60.2	77.8	75.0	69.8	82.0
Laytonsville	64.6	64.6	55.8	51.7	46.0
Luxmanor	76.1	75.0	67.9	63.5	76.7
Thurgood Marshall	65.4	55.1	49.5	46.2	60.5
Maryvale	33.3	28.4	42.0	34.8	39.8
Christa McAuliffe	29.4	43.4	31.5	43.1	45.2
Ronald McNair	34.9	38.4	53.1	54.7	60.7
Meadow Hall	31.5	51.7	57.6	37.3	44.8
Mill Creek Towne	43.4	42.5	39.3	57.0	57.6
Monocacy	68.1	82.9	58.5	63.5	54.2
New Hampshire Estates	-	-	34.4	34.8	42.0
North Chevy Chase	73.2	73.0	80.5	64.3	86.4
Oak View	29.9	23.5	-	-	-
Oakland Terrace	41.7	57.5	43.8	36.3	59.1
Olney	52.9	55.4	61.5	51.6	50.7
Wm Tyler Page	46.5	30.2	51.6	43.8	54.3
Pine Crest	19.4	46.8	28.2	33.7	26.8
Piney Branch	41.3	55.3	50.4	45.4	-
Poolesville	46.5	50.0	47.7	39.7	63.0
Potomac	88.5	87.5	91.3	89.9	71.1
Judith Resnik	37.3	43.3	39.6	43.5	37.0
Sally K. Ride	26.7	44.9	44.2	48.1	52.1
Ritchie Park	69.8	46.7	58.8	63.1	64.4
Rock Creek Forest	36.5	53.6	64.7	52.5	57.6
Rock Creek Valley	54.7	64.7	55.7	51.1	67.4
Rock View	50.0	55.9	40.4	28.4	46.4
Lois P. Rockwell	47.6	60.3	56.8	79.0	67.1
Rolling Terrace	42.3	42.7	39.8	32.6	38.6
Rosemont	50.0	57.1	38.3	60.5	56.3
Sequoyah	55.0	61.5	68.3	49.2	62.2
Seven Locks	87.5	84.0	76.1	63.9	88.9
Sherwood	64.9	66.3	61.4	52.5	59.2
Somerset	87.8	93.0	92.6	95.8	90.6
South Lake	36.8	54.7	42.2	40.0	35.2
Stedwick	44.4	43.9	41.3	48.9	45.6
Stone Mill	61.1	82.4	67.4	64.5	60.8

Exhibit 7.6 (continued)
Performance of Third Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 to 1999

Performance	1999	1998	1997	1996	1995
Stonegate	57.7	71.8	86.3	57.9	78.8
Strathmore	17.2	42.5	31.8	38.3	35.2
Strawberry Knoll	35.2	39.8	48.1	47.7	47.1
Summit Hall	19.2	29.6	39.4	29.7	32.5
Takoma Park	-	-	-	-	55.4
Travilah	75.3	71.4	75.6	64.5	65.1
Twinbrook	30.0	32.9	30.9	27.6	32.6
Viers Mill	36.4	44.4	36.6	39.7	34.2
Washington Grove	38.5	46.4	23.1	45.8	37.5
Waters Landing	72.8	69.0	62.1	56.3	62.2
Watkins Mill	39.0	46.3	42.7	45.7	53.1
Wayside	87.1	73.9	84.8	77.5	72.1
Weller Road	39.7	53.3	60.9	30.5	38.8
Westbrook	75.0	76.4	75.6	66.7	63.5
Westover	36.5	62.7	47.1	53.2	58.2
Wheaton Woods	18.1	23.6	40.8	35.8	28.8
Whetstone	52.1	38.4	55.4	45.6	51.8
Wood Acres	69.6	85.2	85.1	71.7	84.9
Woodfield	72.2	67.0	79.5	64.2	70.8
Woodlin	57.9	69.6	60.0	51.8	59.7
Wyngate	73.5	68.2	65.5	71.8	74.7

As noted in Exhibit 7.6:

- The average performance of Montgomery County Public Schools third grade students on the MSPAP mathematics performance assessments was above the state average each year from 1995 through 1999.
- Thirty-three of 120 schools (28 percent) performed below the state average in mathematics.
- Thirty-one of 120 schools (26 percent) met the state performance target of 70 percent of students achieving proficiency on the MSPAP mathematics performance assessment in 1999, compared with 32 schools in 1998 and 28 schools in 1995.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Exhibit 7.7 summarizes the percentage of fifth grade students achieving the satisfactory level of performance on the MSPAP from 1995 through 1999.

Exhibit 7.7
Performance of Fifth Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 through 1999

Performance	1999	1998	1997	1996	1995
Maryland	46.2	47.9	48.2	47.8	44.7
Montgomery County Public Schools	61.2	61.9	63.2	61.1	59.6
Ashburton	63.5	61.7	73.8	68.3	51.8
Bannockburn	89.7	74.6	81.8	71.2	81.7

Exhibit 7.7 (continued)
Performance of Fifth Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 through 1999

Performance	1999	1998	1997	1996	1995
Barnsley	69.3	69.7	79.4	66.7	74.5
Beall	56.8	60.9	58.8	54.5	54.8
Bells Mill	86.5	84.8	87.5	82.4	82.4
Belmont	70.6	74.7	74.7	82.3	69.9
Bethesda	63.6	80.8	68.2	73.3	74.2
Beverly Farms	88.0	84.2	90.9	81.7	74.1
Bradley Hills	72.8	78.5	70.9	86.7	84.1
Broad Acres	21.4	27.8	41.7	38.6	32.6
Brooke Grove	75.5	74.8	64.6	83.0	72.1
Brookhaven	28.1	34.4	33.9	31.7	36.6
Brown Station	33.3	49.1	42.9	50.0	38.8
Burning Tree	81.9	84.6	87.9	95.1	86.5
Burnt Mills	31.8	28.1	45.1	25.4	54.1
Burtonsville	51.9	63.6	54.2	62.5	75.3
Candlewood	72.8	75.7	70.3	69.9	66.7
Cannon Road	46.3	48.6	53.8	74.6	62.0
Carderock Springs	87.7	93.5	91.8	81.4	94.6
Rachel Carson	54.0	60.0	65.7	59.3	55.7
Cashell	84.5	84.8	79.2	85.1	70.6
Cedar Grove	83.8	83.3	74.4	57.1	70.9
Chevy Chase	81.7	74.8	83.5	74.7	75.5
Clarksburg	75.6	64.3	61.7	45.7	60.8
Clearspring	58.8	65.9	61.5	70.6	49.4
Clopper Mill	45.7	46.1	50.0	40.6	42.6
Cloverly	66.7	82.7	75.7	64.0	62.5
Cold Spring	93.3	95.1	93.9	93.9	88.9
College Gardens	82.5	59.4	71.4	69.3	59.3
Cresthaven	47.9	48.6	43.8	37.3	48.1
Capt James E. Daly	46.8	56.3	62.3	57.8	49.5
Damascus	64.5	80.9	82.0	72.6	79.6
Darnestown	86.8	80.0	75.0	67.7	77.8
Diamond	69.0	67.7	75.4	60.0	68.3
Charles Drew	63.9	76.5	64.0	71.3	71.4
Dufief	86.7	79.7	81.9	77.5	78.4
Fairland	53.3	44.6	5.6	45.6	55.7
Fallsmead	68.2	75.9	83.6	75.0	74.6
Farmland	80.6	85.2	80.9	86.8	78.7
Fields Road	56.7	63.6	62.3	63.6	68.6
Flower Hill	55.8	57.7	67.3	45.1	58.0
Flower Valley	69.6	61.4	70.7	57.3	54.8
Forest Knolls	60.3	68.4	52.9	60.3	52.5
Fox Chapel	61.2	66.1	61.0	62.6	65.6
Gaithersburg	40.8	53.0	59.2	47.2	44.4
Galway	43.4	61.0	53.8	54.5	66.3
Garrett Park	84.5	86.9	75.4	77.8	78.8
Georgian Forest	72.0	45.5	37.7	54.3	61.8

Exhibit 7.7 (continued)
Performance of Fifth Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 through 1999

Performance	1999	1998	1997	1996	1995
Germantown	87.1	60.8	71.4	78.2	71.1
Glen Haven	26.5	31.6	27.1	15.4	20.0
Glenallan	58.4	61.7	64.2	69.9	59.4
Goshen	86.4	78.8	70.8	66.1	63.0
Greencastle	61.5	38.0	32.4	31.2	43.4
Greenwood	71.0	67.1	68.0	69.0	67.8
Harmony Hills	30.0	44.3	56.9	59.4	54.3
Highland	37.4	37.5	47.2	22.5	60.3
Highland View	35.7	28.8	63.9	53.7	30.2
Jackson Road	40.3	41.3	49.2	74.2	77.9
Jones Lane	76.8	76.0	79.8	77.9	73.3
Kemp Mill	45.9	40.2	48.1	45.3	47.1
Kensington-Parkwood	80.0	58.6	67.9	61.0	54.9
Lake Seneca	71.4	63.4	74.4	66.7	76.8
Lakewood	79.5	77.3	78.0	79.7	82.4
Laytonsville	66.3	64.3	54.2	60.4	57.6
Luxmanor	82.1	79.2	86.4	80.8	67.7
Thurgood Marshall	51.6	60.6	64.1	63.3	57.0
Maryvale	43.0	57.1	65.0	63.6	44.4
Christa McAuliffe	45.5	54.1	54.2	51.5	59.7
Ronald McNair	48.7	56.6	39.5	50.7	54.8
Meadow Hall	68.3	62.8	41.2	50.0	57.4
Mill Creek Towne	33.0	55.1	55.3	38.0	56.4
Monocacy	77.8	75.0	82.6	72.9	42.9
North Chevy Chase	81.9	82.5	90.7	73.5	68.5
Oak View	37.9	33.7	28.8	30.4	35.4
Oakland Terrace	54.5	47.7	47.8	49.0	61.1
Olney	65.8	72.3	56.3	65.6	45.7
Wm Tyler Page	59.2	41.7	45.8	42.3	53.2
Pine Crest	43.8	30.6	37.8	50.0	41.0
Piney Branch	45.8	53.0	50.5	50.6	44.9
Poolesville	69.5	72.8	78.4	62.0	53.3
Potomac	88.5	82.8	90.6	85.2	65.4
Judith Resnik	46.3	35.8	42.1	31.5	36.7
Sally K. Ride	61.2	57.8	57.3	59.7	47.1
Ritchie Park	76.2	78.3	78.0	78.6	64.4
Rock Creek Forest	75.4	67.2	74.1	58.5	45.5
Rock Creek Valley	69.8	66.7	68.6	69.4	62.2
Rock View	37.0	48.0	54.3	61.7	32.3
Lois P. Rockwell	62.8	76.5	69.1	70.0	53.2
Rolling Terrace	48.1	39.2	45.3	42.2	25.9
Rosemont	35.6	51.0	62.5	48.8	51.5
Sequoyah	56.5	56.7	72.1	58.2	62.1
Seven Locks	78.6	82.9	86.5	84.8	78.4
Sherwood	69.1	73.6	77.1	67.1	62.0
Somerset	89.7	89.8	92.4	87.9	84.0

Exhibit 7.7 (continued)
Performance of Fifth Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools
1995 through 1999

Performance	1999	1998	1997	1996	1995
South Lake	38.1	44.6	38.7	42.2	28.1
Stedwick	58.8	61.3	53.3	43.3	51.9
Stone Mill	78.2	74.1	67.6	70.0	70.6
Stonegate	63.3	64.0	73.9	66.7	64.9
Strathmore	28.7	28.0	26.1	32.8	41.0
Strawberry Knoll	55.7	53.4	57.5	61.5	40.4
Summit Hall	45.3	30.3	42.9	49.1	17.1
Travilah	82.7	85.5	86.3	80.6	58.4
Twinbrook	56.0	37.5	46.3	30.0	40.2
Viers Mill	34.4	35.4	44.3	47.9	44.6
Washington Grove	55.1	54.5	55.7	55.9	41.3
Waters Landing	59.1	66.3	74.2	50.5	54.1
Watkins Mill	51.7	67.5	58.7	64.5	61.0
Wayside	88.7	83.8	78.0	80.7	86.0
Weller Road	36.3	52.5	43.2	42.6	44.2
Westbrook	88.0	84.9	81.0	83.3	76.2
Westover	63.2	47.8	63.6	58.1	76.6
Wheaton Woods	38.0	43.9	26.3	40.6	36.8
Whetstone	61.1	51.3	58.7	60.5	55.7
Wood Acres	75.6	87.6	92.8	76.5	88.0
Woodfield	68.7	80.0	76.6	87.1	63.8
Woodlin	53.0	59.3	58.1	50.7	70.1
Wyngate	72.3	79.7	74.4	84.0	76.4

As noted in Exhibit 7.7:

- The average performance of Montgomery County Public Schools fifth grade students on the MSPAP mathematics performance assessments was above the state average each year from 1995 through 1999.
- Twenty-seven of 117 schools (23 percent) performed below the state average in mathematics during 1999.
- Forty-one of 117 schools (35 percent) met the state performance target of 70 percent of students achieving proficiency on the MSPAP mathematics performance assessment in 1999, compared with 43 schools in 1998 and 35 schools in 1995.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Exhibit 7.8 summarizes the percentage of eighth grade students achieving the satisfactory level of performance in mathematics on the MSPAP from 1995 through 1999.

Exhibit 7.8
Performance of Eighth Grade Students on MSPAP Mathematics
Compared with State and District Performance
Montgomery County Public Schools

Performance	1999	1998	1997	1996	1995
Maryland	49.0	47.4	45.9	43.3	42.3
Montgomery County Public Schools	66.1	64.3	63.4	57.7	58.8
Argyle	48.8	45.9	44.7	40.5	38.1
John T. Baker	78.5	61.6	65.6	66.1	65.2
Benjamin Banneker	58.0	68.5	56.4	54.5	56.4
Briggs Chaney	64.1	60.0	67.3	61.4	64.7
Cabin John	87.8	89.5	86.1	79.8	81.7
Roberto Clemente	53.2	55.8	57.8	50.5	-
Eastern	53.0	47.4	50.1	46.4	48.9
Wm H. Farquhar	72.2	68.8	76.1	66.5	60.2
Forest Oak	67.8	65.1	59.1	-	-
Robert Frost	89.0	82.3	85.9	73.7	75.4
Gaithersburg	60.8	58.0	62.6	51.6	51.5
Herbert Hoover	88.5	85.7	79.3	83.5	79.6
Francis Scott Key	54.8	54.5	50.7	54.1	52.7
Martin Luther King	61.3	56.5	68.7	52.3	53.1
Kingsview	54.5	-	-	-	-
Col E Brooke Lee	57.8	59.5	52.8	38.8	40.5
Montgomery Village	58.1	61.0	53.7	46.4	53.6
Neelsville	65.6	57.8	-	-	-
Parkland	47.6	43.4	43.6	37.4	41.4
Rosa M. Parks	73.5	69.5	64.3	59.9	61.9
John H Poole	78.6	58.3	60.0	42.6	48.8
Thomas Pyle	85.2	85.8	81.6	79.1	84.1
Redland	75.8	74.8	72.9	57.7	62.9
Ridgeview	60.5	63.2	65.8	57.9	63.5
Rocky Hill	64.5	69.3	67.2	-	-
Sligo	50.4	44.7	50.0	50.8	42.2
Takoma Park	62.4	60.2	65.7	61.7	57.4
Tilden	76.5	77.7	74.8	76.2	76.1
Julius West	63.2	60.7	63.1	47.5	58.1
Westland	78.2	74.0	71.7	66.5	59.1
White Oak	59.3	64.3	57.2	57.0	55.8
Earle B Wood	58.1	59.0	54.1	52.8	57.3

As noted in Exhibit 7.8:

- The average performance of Montgomery County Public Schools eighth grade students on the MSPAP mathematics performance assessments was above the state average each year from 1995 through 1999.
- Two of 32 middle schools (six percent) performed below the state average in mathematics during 1999.
- Eleven of 32 schools (34 percent) met the state performance target of 70 percent of students achieving proficiency on the MSPAP mathematics performance assessment in 1999, compared with seven schools in 1998 and five schools in 1995.
- Although average student achievement each year was above the state averages, overall performance fluctuated from year to year.

Montgomery County Public Schools Student Performance on Goals Mathematics Items

Exhibit 7.9 summarizes the percentile rank scores of fourth and sixth grade students on test company -- developed performance assessment items included on the fourth and sixth grade county criterion-referenced mathematics assessments from 1997 through 1999.

Exhibit 7.9
Performance of Students on the Goals
Montgomery County Public Schools

Grade Level Performance	1997	1998	1999
Grade 4	81	81	81
Grade 6	92	92	92

As noted in Exhibit 7.9:

- The average performance of Montgomery County Public Schools fourth grade students was at the 81st percentile each year on the Goals mathematics performance assessment items.
- The average performance of Montgomery County Public Schools sixth grade students was at the 92nd percentile each year on the Goals mathematics performance assessment items.
- The national average percentile rank on those same assessments was the 50th percentile.

Montgomery County Public Schools Criterion-referenced Mathematics Test Results

Exhibit 7.10 summarizes the percentage of students achieving mastery on the Montgomery County Criterion-referenced Assessments in mathematics as of August 1999 in grades three through five.

Exhibit 7.10
Performance of Elementary Students on the Criterion-referenced Tests
Montgomery County Public Schools

	Grades					
	Third		Fourth		Fifth	
Category	Multi	Open	Multi	Open	Multi	Open
Montgomery County Public Schools Total	**59**	**48**	**56**	**47**	**60**	**47**
Ashburton	79	69	84	79	78	48
Bannockburn	85	63	93	77	100	70
Barnsley	63	54	88	76	86	64
Beall	57	48	75	47	67	33
Bells Mill	81	64	87	79	85	60
Belmont	86	74	89	74	85	48
Bethesda	81	57	78	53	78	55
Beverly Farms	93	63	88	71	85	58
Bradley Hills	90	63	81	58	100	76
Broad Acres	46	17	47	9	50	18
Brooke Grove	69	48	86	67	79	58
Brookhaven	28	18	33	19	39	27
Brown Station	51	39	52	25	41	32
Burning Tree	91	70	88	79	92	69
Burnt Mills	53	34	26	27	40	18
Burtonsville	48	28	59	32	59	29
Candlewood	66	47	79	73	74	60
Cannon Road	59	35	59	30	68	40
Carderock Springs	91	75	97	93	87	75
Rachel Carson	73	48	66	45	56	38
Cashell	79	62	87	63	85	65
Cedar Grove	87	55	91	57	90	46

Exhibit 7.10 (continued)
Performance of Elementary Students on the Criterion-referenced Tests
Montgomery County Public Schools

	Grades					
	Third		Fourth		Fifth	
Category	Multi	Open	Multi	Open	Multi	Open
Chevy Chase	74	60	72	58	86	79
Clarksburg	64	43	77	44	82	48
Clearspring	65	44	66	28	63	44
Clopper Mill	61	40	51	31	76	38
Cloverly	81	71	84	49	76	48
Cold Spring	65	42	92	81	92	87
College Gardens	76	66	73	47	87	73
Cresthaven	73	31	57	24	61	31
Daly	73	55	49	23	56	31
Damascus	74	58	92	60	80	48
Darnestown	73	56	78	58	100	66
Diamond	70	34	78	38	73	47
Drew	62	44	75	59	76	70
Dufief	95	75	91	61	99	80
East Silver Spring	54	-	-	37	-	-
Fairland	68	26	65	41	63	35
Fallsmead	82	74	88	72	89	67
Farmland	78	63	84	65	83	63
Fields Road	90	63	78	53	46	23
Flower Hill	70	57	42	21	52	44
Flower Valley	81	60	80	66	82	53
Forest Knolls	79	51	57	46	64	45
Fox Chapel	73	54	70	60	77	55
Gaithersburg	50	35	50	33	53	28
Galway	48	20	56	33	70	31
Garrett Park	90	81	75	71	90	71
Georgia Forest	85	60	49	37	58	45
Germantown	61	38	71	51	67	58
Glen Haven	52	34	41	22	19	8
Glenallan	47	16	50	39	80	49
Goshen	87	57	83	51	85	63
Greencastle	58	32	32	20	51	29
Greenwood	78	65	76	53	79	52
Harmony Hills	42	23	42	18	38	4
Highland	51	24	75	71	45	30
Highland View	75	59	59	44	58	35
Jackson Road	64	34	73	46	55	38
Jones Lane	92	64	90	74	90	59
Kemp Mill	64	40	50	28	58	31
Kensington-Parkwood	97	85	72	46	87	71
Lake Seneca	60	33	84	51	75	48
Lakewood	89	61	88	69	95	70
Laytonsville	71	49	86	71	66	47
Luxmanor	85	71	89	61	88	48
Marshall	66	38	64	41	50	38
Maryvale	58	32	44	30	38	31

Exhibit 7.10 (continued)
Performance of Elementary Students on the Criterion-referenced Tests
Montgomery County Public Schools

	Grades					
	Third		Fourth		Fifth	
Category	Multi	Open	Multi	Open	Multi	Open
McAuliffe	51	34	52	42	54	41
McNair	67	37	57	31	60	27
Meadow Hall	38	28	43	29	87	64
Mill Creek Towne	77	48	63	38	64	38
Monocacy	76	51	84	73	78	65
North Chevy Chase	84	68	77	57	75	51
Oak View	43	23	46	14	53	17
Oakland Terrace	71	46	-	-	61	33
Olney	76	51	68	38	81	60
Page	81	67	39	31	61	43
Pine Crest	49	24	64	49	67	28
Piney Branch	63	55	54	32	54	42
Poolesville	75	67	72	50	86	56
Potomac	84	61	90	67	90	67
Resnik	67	47	53	39	48	29
Ritchie Park	85	62	61	39	73	48
Rock Creek Forest	62	43	80	59	77	54
Rock Creek Valley	73	44	50	29	65	38
Rock View	52	24	47	24	36	13
Rockwell	80	39	90	60	71	37
Rolling Terrace	65	45	51	39	56	38
Rosemont	64	42	74	45	48	28
Sally K. Ride	40	26	50	25	68	40
Sequoyah	78	56	69	64	66	50
Seven Locks	90	76	68	58	79	62
Sherwood	88	60	77	61	72	45
Somerset	88	63	83	73	92	75
South Lake	57	43	43	17	61	31
Stedwick	69	27	43	15	63	21
Stone Mill	79	61	83	70	90	71
Stonegate	74	47	79	50	51	31
Strathmore	40	25	53	27	34	19
Strawberry Knoll	71	46	53	47	75	44
Summit Hall	56	23	81	62	55	28
Travilah	83	71	79	70	86	69
Twinbrook	51	26	25	12	57	43
Washington Grove	53	33	46	22	62	38
Waters Landing	76	68	73	40	69	47
Watkins Mill	45	28	56	47	64	26
Wayside	86	70	83	60	95	82
Weller Road	75	47	64	21	47	30
Westbrook	84	77	80	65	98	83
Westover	68	45	71	49	77	53
Wheaton Woods	46	12	39	14	36	11
Whetstone	68	56	64	28	77	40
Wood Acres	91	73	92	89	95	77

Exhibit 7.10 (continued)
Performance of Elementary Students on the Criterion-referenced Tests
Montgomery County Public Schools

	Grades					
	Third		Fourth		Fifth	
Category	Multi	Open	Multi	Open	Multi	Open
Woodfield	81	49	78	55	78	47
Woodlin	73	52	71	60	69	51
Wyngate	95	68	72	57	70	57

As noted in Exhibit 7.10:

- The average percentage of Montgomery County Public Schools third grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 59 percent on the multiple-choice component and 48 percent on the open-ended component.
- The average percentage of Montgomery County Public Schools fourth grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 56 percent on the multiple-choice component and 47 percent on the open-ended component.
- The average percentage of Montgomery County Public Schools fifth grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 60 percent on the multiple-choice component and 47 percent on the open-ended component.
- Twenty-eight of 117 schools (24 percent) performed below the district third grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 46 percent (54 of 117) performed below the district average on the open-ended component.
- Thirty-one of 116 schools (27 percent) performed below the district fourth grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 47 percent (55 of 116) performed below the district average on the open-ended component.
- Thirty-two of 116 schools (28 percent) performed below the district fifth grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 49 percent (57 of 116) performed below the district average on the open-ended component.

Exhibit 7.11 summarizes the performance of sixth through eighth grade level students on the Montgomery County Criterion-referenced mathematics assessments as of August 1999.

Exhibit 7.11
Performance of Students in Grades Six through Eight
on the Montgomery County Criterion-referenced Mathematics Tests
Montgomery County Public Schools

	Grades					
	Sixth		Seventh		Eighth	
Category	Multi	Open	Multi	Open	Multi	Open
Montgomery County Public Schools Total	57	50	60	54	59	49
Argyle	32	22	45	27	37	29
Baker	65	59	70	63	66	49
Banneker	60	37	69	52	46	35
Briggs Chaney	67	44	59	52	55	44
Cabin John	90	86	87	79	81	72
Chevy Chase	89	72	-	-	-	-
Clemente	35	27	44	38	37	25
Eastern	31	31	48	47	52	42
Farquhar	81	66	68	56	73	63
Forest Knolls	70	64	-	-	-	-
Forest Oak	63	46	57	37	58	49

Exhibit 7.11 (continued)
Performance of Students in Grades Six through Eight
on the Montgomery County Criterion-referenced Mathematics Tests
Montgomery County Public Schools

	Grades					
	Sixth		Seventh		Eighth	
Category	Multi	Open	Multi	Open	Multi	Open
Frost	88	77	89	77	87	75
Gaithersburg	47	42	42	42	43	37
Hoover	92	80	85	81	95	83
John Poole	64	62	70	65	51	34
Julius West	59	52	70	64	62	56
Key	44	28	51	37	41	29
King	64	44	58	52	54	48
Kingsview	66	52	50	39	48	27
Lee	68	57	47	48	58	50
Maryvale	52	29	-	-	-	-
Montgomery Village	50	37	38	34	37	36
Neelsville	63	44	52	45	66	42
North Chevy Chase	76	67	-	-	-	-
Oak View	27	15	-	-	-	-
Parkland	43	19	36	29	39	30
Pine Crest	52	26	-	-	-	-
Pyle	88	78	91	82	88	79
Redland	64	53	67	64	75	49
Ridgeview	60	44	62	61	58	50
Rocky Hill	60	56	56	43	45	32
Rosa Parks	76	66	60	54	62	43
Sligo	44	21	45	34	42	37
Takoma Park	64	51	65	61	57	53
Tilden	81	56	78	64	83	66
Westland	68	54	79	71	72	58
White Oak	54	39	67	56	60	54
Wood	51	36	57	49	59	38

Exhibit 7.11 shows that:

- The average performance of Montgomery County Public Schools sixth grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 57 percent on the multiple-choice component and 50 percent on the open-ended component.
- The average performance of Montgomery County Public Schools seventh grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 60 percent on the multiple-choice component and 54 percent on the open-ended component.
- The average performance of Montgomery County Public Schools eighth grade students achieving mastery on the Montgomery County Criterion-referenced mathematics assessment was 59 percent on the multiple-choice component and 49 percent on the open-ended component.
- Thirteen of 38 schools (34 percent) performed below the district sixth grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 50 percent (19 of 38) performed below the district average on the open-ended component.
- Sixteen of 32 schools (50 percent) performed below the district seventh grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 53 percent (17 of 32) performed below the district average on the open-ended component.

- Seventeen of 32 schools (53 percent) performed below the district eighth grade average on the Montgomery County Criterion-referenced mathematics assessment multiple-choice component, while 53 percent (17 of 32) performed below the district average on the open-ended component.

Comprehensive Tests of Basic Skills Results

Exhibit 7.12 summarizes the median percentile rank performance of students in grades 2, 4, and 6 on the state-mandated administration of the Comprehensive Tests of Basic Skills, edition 5 (CTBS/5) total mathematics and mathematics computation test during 1997 and 1999. The data for Maryland and Montgomery County represent sample (versus census) data.

Exhibit 7.12
Performance of a Sample of Students on the State-mandated Comprehensive Tests of Basic Skills Mathematics Test
Montgomery County Public Schools

Subtest	Comparison	1997	1999
Grade 2 Mathematics	Nation	50	50
	Maryland*	53	43
	Montgomery County*	63	60
Grade 2 Mathematics Computation	Nation	50	50
	Maryland*	49	49
	Montgomery County*	60	68
Grade 4 Mathematics	Nation	50	50
	Maryland*	51	49
	Montgomery County*	75	72
Grade 4 Mathematics Computation	Nation	50	50
	Maryland*	48	48
	Montgomery County*	66	67
Grade 6 Mathematics	Nation	50	50
	Maryland*	45	51
	Montgomery County*	70	81
Grade 6 Mathematics Computation	Nation	50	50
	Maryland*	44	44
	Montgomery County*	50	66

As noted in Exhibit 7.12:

- The national median performance was 50th percentile for grades 2, 4, and 6.
- The median performance of the Montgomery County second grade student sample on the CTBS/5 total mathematics test was 63rd percentile in 1997 and 60th percentile in 1999.
- The median performance of the Montgomery County second grade student sample on the CTBS/5 mathematics computation subtest test was 60th percentile in 1997 and 68th percentile in 1999.
- The median performance of the Montgomery County fourth grade student sample on the CTBS/5 total mathematics test was 75th percentile in 1997 and 72nd percentile in 1999.
- The median performance of the Montgomery County fourth grade student sample on the CTBS/5 mathematics computation subtest test was 66th percentile in 1997 and 67th percentile in 1999.
- The median performance of the Montgomery County sixth grade student sample on the CTBS/5 total mathematics test was 70th percentile in 1997 and 81st percentile in 1999.
- The median performance of the Montgomery County sixth grade student sample on the CTBS/5 mathematics computation subtest test was 50th percentile in 1997 and 66th percentile in 1999.
- At all grade levels sampled for each year exhibited, the performance of Montgomery County Public Schools students on the CTBS/5 was at or above the state and national averages.

Maryland Functional Mathematics Test Results

Exhibit 7.13 summarizes the performance of Montgomery County Public Schools Middle Schools compared to middle schools overall in the state at the 9th grade level on the Maryland Functional Mathematics Test.

Exhibit 7.13
Comparative Performance of Ninth Grade Students
on the Maryland Functional Mathematics Test of Montgomery County Students
and the State of Maryland at the Middle School Level
Montgomery County Public Schools

Group	Maryland Functional Test Scores		MFT Mathematics Percentage of Students Passing (Enrolled in Montgomery County for Two or More Years)	
	1999	1998	1999	1998
Maryland	**85.3**	**84.8**		
Montgomery County	**92.3**	**93.4**	**95.4**	**95.9**
Argyle	94.7	92.6	95.1	94.8
Baker	97.1	97.5	97.3	98.8
Banneker	97.2	98.7	98.4	100.0
Briggs Chaney	95.3	98.6	97.3	100.0
Cabin John	99.6	100.0	99.6	100.0
Clemente	91.4	94.0	94.9	96.3
Eastern	86.0	93.6	90.7	95.0
Farquhar	98.4	99.3	99.6	99.2
Forest Oak	87.9	89.4	90.2	92.1
Robert Frost	98.7	99.6	99.6	99.6
Gaithersburg	88.8	96.3	93.0	97.9
Hoover	99.7	99.6	100.0	99.6
Key	94.1	95.1	96.7	96.1
King	95.2	97.5	97.1	97.8
Kingsview	-	-	-	-
Brooke Lee	94.2	97.3	96.6	99.3
Montgomery Village	89.9	86.8	90.5	89.7
Neelsville	90.4	-	92.5	-
Parkland	90.3	92.2	91.4	94.9
Parks	97.6	96.3	98.5	97.8
Poole	96.0	99.1	98.2	-
Pyle	99.4	99.1	100.0	99.6
Redland	96.7	96.4	98.1	97.4
Ridgeview	92.5	91.3	94.2	93.4
Rocky Hill	97.6	97.8	98.4	98.8
Sligo	86.4	89.1	89.0	90.1
Takoma Park	91.0	92.3	93.5	96.1
Tilden	97.4	94.8	98.6	96.4
West	97.9	94.6	100.0	97.7
Westland	97.7	94.9	99.1	96.3
White Oak	90.1	93.6	94.3	96.0
Wood	93.2	94.6	95.8	94.9

Exhibit 7.13 shows that:

- The percentage of all Montgomery County middle school students passing the Maryland Functional Mathematics Test (MFMT) in 1998 and 1999.
- All middle schools for the two years displayed exceeded the state standard of 80 percent of students passing the MFMT.
- Student performance on the MFMT for students enrolled in the district for two or more years was higher than the performance of students overall in 30 of 31 schools (97 percent) in 1999, compared to 27 of 31 schools (87 percent) in 1998.

Exhibit 7.14 summarizes the performance of Montgomery County Public high schools compared to high schools overall in the state at the 9th and 11th grade levels on the Maryland Functional Mathematics Test.

Exhibit 7.14
Comparative Performance of Ninth and Eleventh Grade Students
on the Maryland Functional Mathematics Test of Montgomery County Students
and the State of Maryland at the High School Level
Montgomery County Public Schools

Group	Maryland Functional Test Scores		MFT Mathematics Performance of Students Enrolled in Montgomery County for Two or More Years	
	1999	1998	1999	1998
Maryland				
9th	**85.3**	**84.8**		
11th	**95.7**	**95.6**		
Montgomery County				
9th	**92.3**	**93.4**	**95.4**	**95.9**
11th	**97.8**	**98.2**	**98.5**	**99.1**
Bethesda Chevy Chase				
9th	94.0	93.7	97.8	96.1
11th	100.0	98.1	100.0	100.0
Montgomery Blair				
9th	87.3	92.0	90.8	95.3
11th	95.4	97.3	98.6	99.1
Blake				
9th	93.3	-	97.6	-
11th	-	-	-	-
Churchill				
9th	100.0	100.0	100.0	100.0
11th	100.0	100.0	100.0	100.0
Damascus				
9th	96.1	96.3	97.9	98.3
11th	99.4	99.7	99.7	99.6
Einstein				
9th	86.9	86.2	88.8	90.5
11th	99.3	97.9	100.0	98.6
Gaithersburg				
9th	85.4	89.1	89.7	92.1
11th	94.8	97.9	95.9	98.8
Walter Johnson				
9th	96.2	93.9	98.4	96.6
11th	97.0	96.4	98.0	97.7

Exhibit 7.14 (continued)
Comparative Performance of Ninth and Eleventh Grade Students
on the Maryland Functional Mathematics Test of Montgomery County Students
and the State of Maryland at the High School Level
Montgomery County Public Schools

Group	Maryland Functional Test Scores		MFT Mathematics Performance of Students Enrolled in Montgomery County for Two or More Years	
	1999	1998	1999	1998
Kennedy				
9th	92.1	94.6	95.9	97.2
11th	97.2	98.9	98.5	99.0
Magruder				
9th	94.1	93.6	95.7	95.1
11th	97.2	98.1	98.3	99.7
Montgomery				
9th	95.9	94.5	98.7	97.4
11th	98.9	98.6	99.7	100.0
Northwest				
9th	92.5	-	95.8	-
11th	99.1	-	99.0	-
Paint Branch				
9th	94.8	97.2	98.2	99.8
11th	99.7	100.0	100.0	100.0
Poolesville				
9th	97.9	99.4	98.8	99.3
11th	98.4	98.0	98.3	99.3
Quince Orchard				
9th	88.8	90.6	92.5	92.7
11th	97.5	96.0	97.4	98.2
Regional Institute for Child & Adol.*				
9th	88.9	88.0	-	-
11th	100.0	100.0	-	-
Rockville				
9th	91.6	93.8	94.2	94.5
11th	97.4	99.6	98.6	99.5
Seneca Valley				
9th	88.5	93.8	91.8	95.3
11th	97.6	98.7	98.8	99.7
Sherwood				
9th	95.9	96.2	97.8	98.0
11th	97.2	98.3	97.9	98.4
Springbrook				
9th	91.0	92.2	95.7	94.7
11th	98.0	98.0	98.6	99.0
Mark Twain*				
9th	72.4	78.0	-	-
11th	98.1	94.6	-	-
Watkins Mill				
9th	88.9	87.0	92.5	91.0
11th	96.4	99.4	96.8	100.0

Exhibit 7.14 (continued)
Comparative Performance of Ninth and Eleventh Grade Students
on the Maryland Functional Mathematics Test of Montgomery County Students
and the State of Maryland at the High School Level
Montgomery County Public Schools

Group	Maryland Functional Test Scores		MFT Mathematics Performance of Students Enrolled in Montgomery County for Two or More Years	
	1999	1998	1999	1998
Wheaton				
9th	84.8	89.9	90.6	95.1
11th	94.0	94.2	94.0	96.2
Walt Whitman				
9th	98.5	97.6	100.0	99.3
11th	98.4	99.2	99.4	99.7
Wootton				
9th	99.2	99.8	99.5	99.7
11th	100.0	100.0	100.0	100.0
Alternative Program*				
9th	75.5	83.9	--	--
11th	97.5	92.1		

* Note: Schools with asterisk (*) are not comprehensive high schools, but serve special student populations. Data for these schools was not used for comparisons).

Exhibit 7.14 shows that:

- The percentage of students passing the Maryland Functional Mathematics Test (MFMT) at the ninth grade level exceeded the state average for all high schools in Montgomery County Public Schools in 1998 and 1999.
- The percentage of students passing the Maryland Functional Mathematics Test (MFMT) for all high schools at the eleventh grade level exceeded the state average in all schools in Montgomery County Public Schools in 1998 and 1999.
- All high schools for the two years displayed exceeded the state standard of 80 percent of students passing the MFMT at ninth grade status in 1998 and 1999.
- Student performance on the MFMT of ninth grade students enrolled in the district for two or more years was higher than the performance of students overall in all schools for both 1998 and 1999.
- Eleventh grade student percentages passing the MFMT (enrolled in the district for two or more years) was higher in 16 of 23 schools (70 percent) in 1998 than in 1999.

Student Mark Distributions of the District-developed Algebra 1A and Geometry 1A Examinations

Exhibits 7.15 and 7.16 summarize the distribution of final exam marks of Montgomery County Public Schools students on the district's algebra IA assessment for eighth and ninth grade students as of January 2000.

Exhibit 7.15
Mark Distributions of Eighth and Ninth Grade Students
on the Algebra 1A Final Exam
Montgomery County Public Schools
January 2000

Grade Levels	Grade Mark of "A"	Grade Mark of "B"	Grade Mark of "C"	Grade Mark of "D"	Grade Mark of "E"
8th Grade Only	20.3%	26.8%	25.0%	14.5%	13.4%
9th Grade Only	3.1%	6.5%	14.4%	18.9%	57.2%

Exhibit 7.15 shows that:

- Forty-seven percent of 8th grade students enrolled in algebra 1A earned a grade of "B" or higher on the final exams administered during the 1998-99 school year, compared with about 10 percent of 9th grade students.
- Thirteen percent of 8th grade students enrolled in algebra 1A earned a failing grade on the final exams administered during the 1998-99 school year, compared with 57 percent of 9th grade students.

Exhibit 7.16
Mark Distributions of Students on the Geometry 1A Final Exam
Montgomery County Public Schools
January 2000

Grade Levels	Grade Mark of "A"	Grade Mark of "B"	Grade Mark of "C"	Grade Mark of "D"	Grade Mark of "E"
Geometry	5.2%	14.7%	17.3%	17.6%	45.2%
Honors Geometry	15.4%	36.8%	26.8%	12.9%	8.1%

Exhibit 7.16 shows that:

- Fifty-two percent of geometry honors students earned a grade of "B" or higher on the final exams administered during the 1998-99 school year, compared with about 20 percent of regular geometry students.
- Eight percent of geometry honors students earned a failing grade on the final exams administered during the 1998-99 school year, compared with 45 percent of regular geometry students.

Advanced Placement Mathematics Results

Exhibit 7.17 summarizes the performance of Montgomery County Public Schools students on Advanced Placement mathematics examinations compared with national AP performance.

Exhibit 7.17
Comparative Performance on Advanced Placement Mathematics Examinations
of Montgomery County Students and the Nation
Montgomery County Public Schools

	Calculus AB		Calculus BC		Statistics	
Group	% 3 +	# Tested	% 3 +	# Tested	% 3 +	# Tested
Montgomery County Public Schools	87.0	262	81.5	503	90.3	186
National Performance	63.4	124,143	79.2	30,287	57.2	24,805

Exhibit 7.17 shows that:

- Eighty-seven percent of Montgomery County Public Schools students earned scores of three or better on the calculus AB exam, compared with 63 percent national performance.
- Eighty-two percent of Montgomery County Public Schools students earned scores of three or better on the calculus BC exam, compared with 79 percent national performance.

- Ninety percent of Montgomery County Public Schools students earned scores of three or better on the statistics exam, compared with 57 percent of all students nation-wide.
- Performance of Montgomery County Public Schools students exceeded national performance in 1999 on all three mathematics Advanced Placement examinations.

Student Performance on the PSAT and SAT

Exhibits 7.18 and 7.19 summarize student performance in the Montgomery County Public Schools on the PSAT and SAT.

Exhibit 7.18
PSAT Performance Comparisons of Montgomery Students with the Performance of Students in the Nation
Montgomery County Public Schools

PSAT Total Performance				
Comparison Group	**1995**	**1996**	**1997**	**1998**
Montgomery County	106	105	107	104
Nation	97	97	97	96
PSAT Mathematics Performance				
Comparison Group	**1995**	**1996**	**1997**	**1998**
Montgomery County	53.6	53.0	54.3	52.6
Nation	48.9	49.2	48.9	48.6

Exhibit 7.18 shows us that:

- Montgomery County Public Schools 10th grade students outperformed the average 10th grader in the nation each year from 1995 through 1998 on the PSAT.
- Montgomery County Public Schools 10th grade students outperformed the average 10th grader in the nation each year from 1995 through 1998 on the PSAT mathematics section.

Exhibit 7.19
SAT Performance Comparisons of Montgomery Students with the Performance of Students in the Nation
Montgomery County Public Schools

SAT Total Performance					
Comparison Group	**1995**	**1996**	**1997**	**1998**	**1999**
Montgomery County	1087	1088	1092	1092	1096
Nation	1010	1013	1016	1017	1016
SAT Mathematics Performance					
Comparison Group	**1995**	**1996**	**1997**	**1998**	**1999**
Montgomery County	547	550	553	555	556
Nation	506	508	511	512	511

Exhibit 7.19 shows us that:

- Montgomery County Public Schools 12th grade students outperformed the average 12th grader in the nation each year from 1995 through 1998 on the SAT total score.
- Montgomery County Public Schools 12th grade students outperformed the average 12th grader in the nation each year from 1995 through 1998 on the SAT mathematics section.

Analysis of Montgomery County Public Schools overall student performance on the MSPAP mathematics performance assessment, the Maryland Functional Mathematics Test, GOALS mathematics performance items, and the CTBS/5 exceeded state and national averages at all grade levels. This same picture is observed when an analysis is conducted of student performance on the AP, PSAT, and SAT exams. Though there are some performance fluctuations by grade level, this pattern of improved student performance has been fairly consistent since 1998 on the MSPAP,

CTBS/5, PSAT, and SAT. Performance on the Goals items remained the same across each year tested for grades 4 and 6.

Analysis of student and school grade level achievement data presents a slightly different picture. Examination of disaggregated data on the MSPAP, MFT, and Montgomery County Criterion-referenced mathematics tests show that large gaps in performance exist when average school performances are compared with a number of schools performing below the state and district averages. These data reflect the fact that while student achievement in the Montgomery County Public Schools are above state and national averages, all students are not achieving equally well.

Finding 8: Use of Assessment Data for Program Improvement Is Ineffective and Inconsistent.

Essential to a sound program of curriculum design is feedback produced from a school district's assessment and evaluation system. A well-designed assessment and evaluation system gathers a variety of data that allow school district leaders to continuously monitor student achievement, evaluate programs and personnel and improve learning. In order to accomplish this task, there must be evaluation instruments in place that demonstrate how well specific programs and personnel are producing the desired student achievement.

Once assessment and evaluation data are received and analyzed, a clear set of criteria are established and used to determine whether or not a program should be reinforced, revised, or eliminated and whether personnel ought to be retained, retrained, or terminated.

The auditors interviewed board members, administrators, teachers, other staff, and parents about the use of assessment data for instructional improvement. The results of these interviews indicate that the use of assessment data in the Montgomery County Public Schools for instructional improvement is inconsistent and ineffective.

Information Provided from Interviews

This section summarizes the perceptions of central administrators, program coordinators, directors, principals, teachers, and a parent regarding the use of data in the Montgomery County Public Schools.

Central administrators reported that:

- "Data is (sic) an issue up here. We do not have access to the school data. At the Central Office, we don't have our own access to a school's data."
- "We need access to school data. We need to look as a system at where we're falling down."
- "[Some] teachers would like us to develop quarterly assessments that would relate to the MSPAP as a diagnostic tool rather than ISM, which is mostly multiple-choice tests. ISM has no meaning in terms of what children will do on the CRTs and the MSPAP."

Directors and program coordinators indicated that:

- "Principals at the school level look at the data to determine how to improve student performance. Two elementary principals have put together a system to make the data more accessible to other principals."
- "If you are in a global access school (definition), you have better access to the network systems. Sometimes teachers do not have access to all of the information."
- "The [school improvement plan] requires schools to use at least three pieces of data from their schools. School staff are expected to do a review of the data and identify predictors of achievement."
- "At high school, the data is used more programmatically. [They] look at data to improve success rates. [They do not] look at individual student performance as closely there."
- "Grades have been used most often as an accountability element at the high school level."

- "ISM items are now outdated and out of context. Do you fix the system by creating software and new items, or do you move to quarterly assessments on it?"

Math Football at Gaithersburg Middle School

Principals said that:

- "We don't get data from the central office in a usable form. I have to take the data and extrapolate it myself to do what I need to do."
- "As a principal, I rely most heavily on CRT data for information on student achievement."
- "Testing drives instruction."
- "The record keeping for ISM is very cumbersome."

Teachers stated that:

- "We get copies [of test results] as soon as the data is (sic) published. It comes to the principal and the principal gets the data to us."
- "We have reviewed trend data on student test scores."
- "I believe that the ISM is a little bit of overkill. The CRT's should be able to tell us what we need to know about students."
- "The ISM, CRT, and MSPAP assessments drive teaching more than I'd like them to."
- "It is a difficult time to be teaching mathematics. ISM alone encompasses all of the skills that a child will need, but it is limited. You teach a skill and then you leave it. It is not real life application [of mathematics]. ISM is disjointed. CRT's measure what ISMs should. MSPAP is more real-life. Instead of teaching to learn, we're teaching to test."

A parent reported that:

- "Grades don't reflect what's going on with a test. Grades are grossly inflated. Grades must reflect performance."

Comments made by central office administrators, program directors/coordinators, and principals represent inconsistencies in the use of assessment data for program improvement. Some report not receiving data, others report conducting extensive analyses of assessment data. Principals cite the need for additional training on data analysis and interpretation. Among program

directors/coordinators, there seems to be some mistrust of the data, and acknowledgement that data are not used. Two of the directors/coordinators reported that data are not used for program improvement or elimination. Central administrators indicate that improvements in use of assessment data are forthcoming. Each group has raised concerns about the format in which data are provided, stating it's "not user-friendly."

In summary, comments made by central office administrators, program directors/coordinators and principals represent inconsistencies in the use of assessment data for program improvement. Each group interviewed also raised concerns about the format in which some data are provided and issues with the student information management system. Use of assessment data for program improvement is ineffective and inconsistent.

Finding 9: Monitoring of Curriculum at the Building Level Is Inadequate and Unproductive.

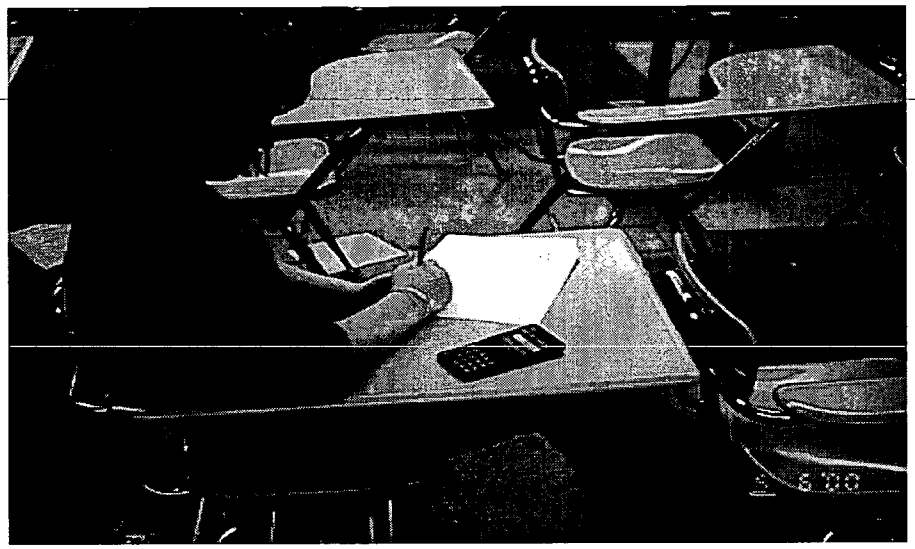
Curriculum and instructional supervision can be an effective tool to ensure that the curriculum is being taught, to improve teaching strategies, and thereby improve learning. Teaching and learning succeed best when curriculum monitoring is systemic and takes place at all levels of the organization. Written documents are needed to establish guidelines and expectations for central office administrators and principals regarding monitoring the curriculum.

District level staff has overall responsibility for providing instructional resources, staff development, and ongoing support for the delivery of the curriculum. The role of the central administration is to aggregate the individual building data to develop a systemic view of the curriculum management effort. The central office, through staff development, the equitable distribution of resources, and centralized data management, supports systemic improvement.

Primary responsibility for monitoring teacher practices and delivery of the curriculum rests at the building level with the principal. Providing effective leadership aimed at diagnosing instructional behaviors, providing constructive feedback, and modeling appropriate instructional behaviors, the principal is uniquely positioned to evaluate the alignment of the written, taught, and tested curriculum at the building level.

Overall, written documents regarding the role of district office staff, principals, assistant principals, and other instructional supervisors should clarify expectations regarding curriculum monitoring. Monitoring should focus primarily on realizing desired student outcomes by encouraging instructional practices that bring about those outcomes. Monitoring also encompasses evaluation and facilitating teachers' use of assessment data to modify the design and delivery of the curriculum. When monitoring is absent or inconsistent, curricular content may not be delivered or may not be delivered in the most effective manner. Student learning may be negatively affected.

The auditors reviewed policies, job descriptions, and other documents to determine what was expected of principals, assistant principals, teachers, and district office staff regarding the monitoring of curriculum delivery. The auditors also interviewed members of the Board of Education and central office administrators to identify the district's curriculum delivery and monitoring expectations. Auditors determined that there was no statement of expectations (beyond the unspoken expectation to teach the Maryland learner outcomes and core learning goals) or written guidance on curriculum monitoring across the district.



Using Graphing Calculators at Cabin John Middle School

Furthermore, the auditors observed that:

- There were no policies or regulations requiring monitoring and no formal monitoring plans.
- Job descriptions for administrators did not specifically address curriculum monitoring.
- Principals reported and demonstrated little formal training in monitoring the curriculum.

The magnitude of the curriculum, accompanied by an abundance of material and information from the district and state as to what needs to be taught, complicated curriculum monitoring activities. Instructional System in Mathematics (ISM), CRT, MSPAP, Functional Mathematics Test, and CTBS objectives or outcomes predominated a field of what needed to be taught. Some principals monitored instruction based on the ISM, others looked at the CRT, and some focused their efforts on the MSPAP. Some principals were consumed by non-classroom duties and openly admitted their ineffectiveness in consistently monitoring the curriculum. Others were not certain about the duties and responsibilities for monitoring.

Overall, the auditors found inconsistencies in expectations and practice. Most people recognized the building principal as being responsible for monitoring the curriculum; however, the specifications regarding the monitoring function varied, as did the actual performance of this function. Expectations for the written and taught curriculum varied from school to school. Consequently, the results of effective monitoring and a high level of consistency in curriculum delivery practices are not being achieved in the Montgomery County Public Schools.

Interview statements indicate the following examples of inconsistencies resulting from a lack of curriculum monitoring:

- "Most teachers trash all objectives in the [mathematics] strand that they don't understand...they teach what they are comfortable teaching."
- "My 4th and my 5th grade children are both doing the same work in mathematics."
- "Most of my teachers teach all the objectives within the mathematical strand and then move to the next strand...they do not integrate the objectives as is needed for the MSPAP."
- "There is nothing in place to make sure teachers are teaching the curriculum of the district...some focus on the ISMs, others focus on the MSPAP...few teachers are able to focus on everything."

- "Schools focus on behavior and self-esteem rather than learning."
- "We operate with a high degree of trust in our teachers...we hope they are teaching what they are supposed to be teaching."

Auditors heard additional comments regarding ineffective or improper monitoring practices, and inadequate training for principals in proper practices:

- "Principals are inconsistent in their monitoring of the curriculum. Some principals look at lesson plans, some look at the lSM results, and some look at the CRT results...some look at [no results]."
- "Some principals do not get into the curriculum...they are better managers."
- "Principals have not had the training to be effective instructional leaders...new administrators are more knowledgeable than those who have been in the role for many years...the role of the principal as an instructional leader is a new concept."
- "Principals need a checklist as to what they need to look for in effective instruction."
- "Principals are in need of training on the curriculum...they get caught up in the management role instead of the instructional leader."
- "l wish l had more time to be an instructional leader."
- "There is no consistency among principals as to their expectations for learning in the classroom."
- "Monitoring instruction is done through tests from the lSMs and the CRTs."

ln general, the absence of clear expectations combined with inconsistencies in classroom monitoring caused auditors to conclude that monitoring of instruction was ineffective and unproductive and could not assure quality delivery of the curriculum. The overall skills of principals do not provide the level of instructional leadership and monitoring required for quality control.

Finding 10: Staff Development in Mathematics Is Extensive But Is Inadequately Focused or Linked to District Instructional Priorities.

Staff development programs and services require effectively preparing and supporting staff for implementing of the curriculum. Planning for sound curriculum delivery requires connections to training, and staff development that reinforces and reflects district direction.

A district that is committed to continuous improvement acknowledges the need for staff development. lts programs become an ongoing process that involve all segments of the organization in a dialogue. Long-term change requires detailed staff development and implementation plans conducted over several years. Selection of improvement goals and programs that guide staff development involve those who have a stake in the future of students in their district. Thus, staff development needs to be a well-defined program that enables school personnel to improve professional practices in ways that increase student learning.

The auditors gathered information about current and previous math staff development efforts in the Montgomery County Public Schools to determine if linkages were present between those efforts and program planning and design, as well as with student assessment results. Teachers and administrators provided considerable information during interviews about training and staff development activities and plans at the school level and district level. The auditors were presented with documents that reflected training for administrative and teaching staff.

The auditors found staff development efforts to be extensive in scope, but fragmented in their implementation. District policies and documents provide inadequate direction for staff development in mathematics, and auditors found no evidence of linkages between staff development efforts and mathematics program planning and design, and the results from mathematics assessments. ln

addition, auditors found no comprehensive document directing and coordinating all staff development initiatives within the district.

Nationally-adopted standards provide guidance for the design and implementation of staff development efforts. These standards, as well as other research in the field of staff development, have been used to create 18 audit characteristics for effective staff development programs. The criteria are built around two major categories: context and process. Context criteria address the organization and culture in which new learnings are to be implemented. Process criteria refer to how staff development efforts take place—the means for the acquisition of new knowledge and skills. These characteristics and the auditors' assessment of the district's staff development endeavors are presented in Exhibit 10.1:

Exhibit 10.1
Characteristics of a Comprehensive Staff Development Plan
and Auditors' Assessment of District Approach
Montgomery County Public Schools
2000

Characteristic	Auditors' Rating		
	Adequate	Partially Adequate	Inadequate
1. Has policy which directs staff development efforts.			X
2. Has a current plan which provides a framework for integrating innovations related to mission.	X		
3. Has a staff development mission in place.	X		
4. Is built using a long-range planning approach.			X
5. Fosters a norm of continuous improvement and a learning community.			X
6. Provides for organizational, unit, and individual development in a systemic manner.			X
7. Is for all employees.			X
8. Expects each supervisor to be a staff developer of staff supervised.			X
9. Focuses on organizational change -- staff development efforts are aligned with district goals.		X	
10. Is based on a careful analysis of data and is data-driven.			X
11. Focuses on proven research-based approaches that have shown to increase productivity.			X
12. Provides for three phases of the change process: initiation, implementation, institutionalization.			X
13. Is based on human learning and development and adult learning.			X
14. Uses a variety of staff development approaches.		X	
15. Provides the follow-up and on-the-job application necessary to ensure improvement.			X
16. Requires an evaluation process that is ongoing, includes multiple sources of information, and focuses on all levels of the organization which are based on actual changed behavior.			X
17. Provides for system-wide coordination and has a clearinghouse function in place.			X
18. Provides the necessary funding to carry out staff development goals.			X

The "Call to Action Plan" speaks to a direction for staff development, but no formal staff development plan for the district is in place. All buildings created a "Success for Every Student Plan" with a section entitled "Staff Development Plan," which encompasses a one-year time span.

All SES plans have a district vision and the same four goals, but the plans are not comprehensive, nor are they long-range in approach. Many of the plans listed activities the teachers would "do" pertaining to a specific district goal, but failed to specify the training and follow-up teachers would receive in order to achieve the goal. There was no specific staff development plan for the delivery of the math curriculum.

Although the auditors found documents related to a wide range of staff development and training activities during the 1999-2000 school year, no comprehensive needs assessment process was in place which would provide the foundation for staff development planning. Many staff development activities were coordinated at the site level or by departments or programs; therefore, providing little consistency of training throughout the district. Evaluation of the effects of the training was lacking.

Although a variety of staff development activity has been offered and is planned for the summer, the auditors found that there was no linkage to an overall planning document or to the goals of the district as a whole. There was little evidence that staff development efforts were connected with professional development plans for staff. There were no databases for a principal to know which staff members had received training in mathematics, and most were unfamiliar with what training their teachers needed. Most staff development is voluntary, including the new teacher induction program. On-site interviews revealed:

- "There hasn't been a county focus to help a principal know where to focus. That, I think, is important. We do need to find some time for them (teachers) to collaborate, but it's not in our county culture to do that." (principal)
- "We've talked about the fact that training (for principals) doesn't exist." (administrator)
- "There's tons (sic) of courses offered, but whether they've been focused and aligned, I don't know." (coordinator)
- "Staff development can be described as 'catch as catch can'...there is no time for training is not consistent." (teacher)
- "Staff development is not as aligned as it should be." (director of staff development)
- "We make very little distinction (when providing staff development training) between schools with high needs and those with low needs." (assistant supt.)
- "The staff development we do...we're carving out the time. There is no time." (principal)
- "There's confusion and contradiction in staff development." (administrator)
- "Staff development is scattered." (community supt.)
- "Staff development is voluntary; there is no building required inservice." (teacher)
- "We haven't addressed math like we should have with staff development." (principal)
- "Staff development has been 'drive-by training' or 'smorgasbord.'" (principal)
- "Our teachers go to the math training, but there is no one to see that it is implemented." (teacher)
- "It's very confusing with staff development coming out of everywhere." (teacher)

At the district level, there is support for staff development. The Continuous Improvement/Staff Training and Development Work Group Report and transitional organizational plan was presented to the Board of Education in June 1998, and was approved. Some improvement in this direction has occurred although financial support for the staff development has yet to follow suit.

When staff development expenditures were examined by the auditors, it was determined that very little money was allotted to comprehensive staff development at the building level, even though there was a substantial amount of verbal and written support for it. Teachers, on average, have 4.1 days per year for all training. However, the "Call to Action" and the new budget for 2000-2001 have allotted for staff development specialists in each building, regardless of different needs. The auditors found there to be excessive disparity across schools, a disconnect between what the district is doing

and what the buildings are doing, and an inadequate distinction between high performing and low performing schools, other than a few programs and grants.

Little evidence exists that follow-up activities are provided for training as in a results-based staff development model. In addition, little to no time for reflection or collaboration by the teachers involved in training was noted. Although the district wants to tie staff development to performance, performance data are lacking. There is little documented evidence of teacher behavior change as a result of the staff development opportunities.

Principal staff development needs to be enhanced to include grouping strategies, curriculum alignment and monitoring, and instructional supervision.

In summary, the auditors found a strong encouragement from management for improved staff instruction, and extensive training opportunities from many departments; however, past and current efforts show inadequate focus and linkage of staff development to district instructional priorities (see Finding 9.1). No comprehensive plan for math staff development exists.

Finding 11: Staffing in Mathematics Supervision Is Inadequate and Weakens the Quality of Mathematics Program Design and Delivery.

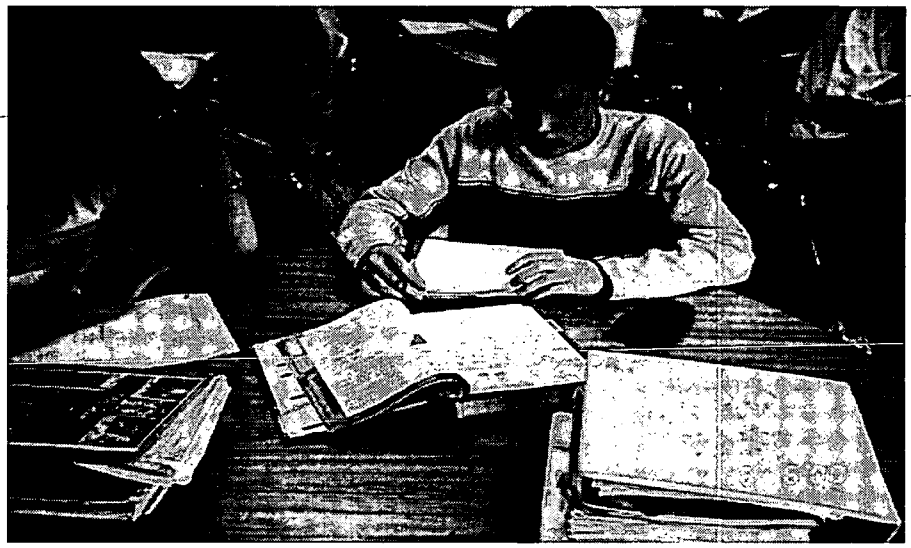
The design and delivery of a sound instructional program in any content area requires the expertise of knowledgeable staff with adequate time and resources to design the curriculum and oversee its implementation. While resources necessary to create the basic design may be fairly consistent for districts of all sizes, the resources required to support the delivery of curriculum increase in proportion to the number of students and teachers in the district.

In a district the size of Montgomery County, auditors expected to find a mathematics support staff consisting of coordinators who were mathematics professionals and a well-trained district cadre who could assist with curriculum development, provide ongoing professional development, and support building personnel as needed. In addition, auditors expected to find staffing allocations at individual buildings used to support mathematics instruction.

To determine staffing patterns related to mathematics, auditors reviewed staffing and enrollment figures, interviewed district-level personnel, and visited individual buildings to talk with building staff.

The auditors found that the current supervisory staff in mathematics is competent and qualified, but too few to meet the needs in the district. There are currently two coordinators of mathematics to serve all elementary classrooms (approximately 3000 of them) and 725 secondary mathematics teachers. Three resource teachers support the two coordinators at the elementary level; two of the three plan and deliver staff development and the third has a variety of duties, some of which do not pertain to mathematics. A middle school mathematics teacher joined the district staff in the last year to assist in the revision of middle school mathematics.

Some support at the building level is consistent across the district. Each high school has a mathematics resource teacher who serves as the department chair. The resource teachers meet with district personnel on a monthly basis. In elementary and middle schools every building has an Instructional System in Mathematics (ISM) aide who manages the record keeping and provides support for the mathematics program in a variety of ways. Instructional System in Mathematics (ISM) aides are not certified personnel and no specific training in mathematics is required; however, many building principals reported that their ISM aides were quite knowledgeable and competent in mathematics and provided assistance to students. Some buildings have their own mathematics specialists, either full or part time, and qualifying buildings have Title I support. In the next school year each building will have an individual responsible for staff development, but specific expertise in mathematics staff development is not required of the teachers hired for those positions.



Textbook Duty at Cabin John Middle School

In the mid 1990s the district received a National Science Foundation grant that supported extensive content training at the elementary level. Two individuals who were hired to do mathematics staff development as part of that grant are still part of the district mathematics staff, but they cannot meet the ongoing needs of elementary teachers across the district. A concern expressed repeatedly was that elementary and middle school teachers lack sufficient mathematics content knowledge. Specific comments heard by auditors include the following:

- "There are no certified mathematics teachers in our middle school."
- "Students who take algebra [in the middle school] from a teacher with K-8 certification are not as prepared for the rigor of high school mathematics."
- "Many teachers are uncomfortable teaching certain aspects of the mathematics curriculum."
- "Teacher training is an issue, especially at [the] elementary level. Teachers teach what they were comfortable teaching. Retention of qualified teachers at middle school is a problem."
- "We have teachers with special education certification but no math content. We need teachers who know the content."
- "My biggest wish would be to assure that all teachers have a broader and better knowledge of math."
- "It's difficult to get a math certified teacher at the middle schools. Everyone is a generalist."
- "The training quit when the grant ran out on Math Content and Connections; if our teachers could have that level of training our instruction would be so much better."

In addition to content needs, district personnel raised issues about pedagogy, assessment, and classroom management that related directly to the level of staffing support for the mathematics program:

- "There are few persons to address our needs in mathematics. Our emphasis has been in reading."
- "We have very little training on how to use math manipulatives, so they are used infrequently."
- "People are not trained to write tests, they just write. There is no chance for math resource people to read, critique, revise."

- "We haven't had any training in moving from the old curriculum to the middle school math ABC curriculum."
- "I talk to other teachers to help me know what to teach."
- "New teachers say, 'I don't understand ISM.'"
- "There is no one to help teachers get started in the ISM system."
- "Approximately 50 percent of our teachers attended the new curriculum training."

Insufficient staff and budget resources to support timely curriculum revision and development were evidenced by the fact that elementary curriculum has not been revised since 1989. A proposed timeline for the upcoming elementary mathematics revision (included in a December 1999 memo from the elementary mathematics coordinator to the Council on Instruction) had a starting date of 1998 and a conclusion of revision with full implementation in 2007. The development of instructional guides and the multiple assessments expected at each grade level is a demanding task; district-level personnel developing the revision timeline believed it would take that long to complete the entire process with the current level of staffing.

The process of aligning county curriculum and assessments to Maryland standards has been an ongoing and demanding process that is yet to be completed. In addition to developing a curriculum for "all students," mathematics coordinators have been involved in creating a dual curriculum for gifted and talented students. These demands have precluded program evaluation to look at what works and what doesn't work in the current curriculum.

In summary, auditors found a hard-working but understaffed mathematics department at the district level. Two coordinators and four teacher resource positions are not sufficient to oversee the design of curriculum and assessments, then provide the staff development and support necessary for successful delivery of the mathematics program.

Finding 12: Materials for Instruction Are Plentiful, But There Is Little or No Focus System-wide.

A carefully thought out, well-articulated curriculum is the starting point for strong student achievement in any subject area. Once desired learning goals have been established by a system, personnel within the system can use those goals to select instructional materials that will be effective and efficient in meeting those goals. Instructional materials and equipment in mathematics can include, but not be limited to, basic textbooks, reference, and resource materials for teachers and students, manipulatives, and technological tools such as calculators and computers.

Auditors expected to find teachers and students in Montgomery County using basic mathematics textbooks that were aligned with the curriculum and specifically referenced in curriculum documents. In addition, auditors expected to see evidence of best practice through the use of manipulatives and tools of technology available to assist students with learning.

Math Resources Room at Oak View Elementary

To determine what instructional materials were available to teachers, the audit team reviewed the list of approved instructional materials provided by the mathematics office, visited schools to observe resources available at buildings, and interviewed district personnel.

The auditors found that there is an abundance of materials available to mathematics teachers in Montgomery County, both in basic textbooks and in resources such as manipulatives and calculators, but there is no guidance as to how textbooks are to be selected by buildings nor specific direction as to how they can best be used. None of the textbooks are referenced in curriculum guides (see Finding 5). A complete list of approved textbooks is provided in Exhibit 12.1.

Exhibit 12.1
Approved Mathematics Textbooks, K-12
Montgomery County Public Schools

Grade Levels/Course	Number of Approved Texts	Range of Copyright Dates
K-2	1	1996
K-3	2	1995
K-5	1	1998
K-6	4	1995-1999
K-8	3	1994-1999
5-8	1	1997
6	4	1995-1999
7	5	1995-1999
8	4	1996-1999
Algebra I	4	1995-1998
Related Mathematics	1	1994
Algebra 2/Algebra 2 with Analysis	4	1995-1998
Algebra 2 References	4	1995-1996
Calculus	2	1998-1999
Calculus with Applications	2	1996-1997
Consumer Mathematics	2	1989-1998
Consumer Mathematics References	1	1989
Geometry	3	1997-1998

Exhibit 12.1 (continued)
Approved Mathematics Textbooks, K-12
Montgomery County Public Schools

Grade Levels/Course	Number of Approved Texts	Range of Copyright Dates
Maps 1*	1	1989
Applications of Math/Maps II	4	1988-1992
Maps 2	1	1995
Precalculus/Precalculus with Analysis	4	1997
Probability and Statistics	2	1991-1995
Introduction to Statistics	2	1985
Statistics References	3	1990
AP Statistics	2	1993-1999
AP Statistics References	8	1990-1997
*Text the same as one of the Consumer Mathematics textbooks		

The following can be noted from Exhibit 12.1:

- Twelve different textbook series have been approved for elementary grades K-5, with some of those series extending into middle school grades.
- At least four textbooks per grade level, beyond those included as K-8 or 5-8 in the elementary school list, have been approved for middle school.
- The copyright date on all elementary and middle school books is 1994 or later.
- The number of texts approved for any given high school course ranges from one to four.
- Copyright dates on high school textbooks range from 1985-1999.
- The majority of older copyright dates are found in books for lower level courses, such as consumer math or maps 1 and maps 2.
- One textbook with a 1989 copyright date is listed as a textbook for both consumer mathematics and Maps 1.

In several cases, courses that are sequential have books approved from the same publisher. For example, three of the books at each grade level 6-8 are part of a series that is available to be used for an entire middle school experience. Sequential textbooks from two different companies have been approved for algebra 1 and algebra 2. However, there is no written recommendation that schools should use the same series. As a result it is conceivable that a middle school student could proceed through three years of mathematics at the same school and use a different textbook series each year, missing out on the advantage provided by familiarity with format of teaching illustrations and practice problem sets.

The unit organization of the mathematics curriculum in place at the high school level and evident in the revisions piloted at middle school in 1999-2000 makes it very difficult to select and use a basic textbook (see Finding 6), and be assured of consistent alignment between the units and the text. Extensive packets of high quality worksheets have been compiled for courses such as algebra 1 and algebra 2 and have been reproduced in the district print shop. These are available for schools to order and use as part of instruction, but they are practice materials without accompanying instruction to guide students. The cost of extensive printing added on to the purchase of textbooks that are not used on a regular basis increases the cost for each mathematics course.

A concern related to textbooks was expressed by both teachers and administrators across all grade levels:

- "It is very difficult to know what materials to use when there is little direction and focus within the district."
- "We have a lot of materials, but little consistency in what they are to be used for."
- "We are putting a lot of money into texts that we may use only ten days."

- "The district should either publish its own book or buy a book that is well aligned with what we teach. Currently we worksheet kids to death."
- "Our system needs to be teaching the same content from the same textbooks. There is a big impact on mobile, at-risk kids when books are different. Keep the books the same."
- "There is no one math book that is used in Montgomery County at any one level."
- "Parents want a good resource in terms of a textbook. They want to see examples or to have a hard copy in their hands to refer to."
- "Parents are looking for continuity. That's what the textbook provides for them."
- "I'd like one single textbook that we all could use."

Manipulatives are abundant and calculators are available district-wide. Computers are available in every school, but the number of computers in each school and their availability in classrooms vary greatly on a per-pupil basis. Ways to use manipulatives to teach specific concepts are included in curriculum guides at the elementary level, and references to use of the graphic calculator are plentiful in secondary curriculum materials. Many of the worksheets developed by the district specifically address calculator-based problems and activities.

Auditors saw well-stocked resource rooms with a wide array of hands-on materials in elementary schools they visited; in addition to resources available to be checked out as needed, most teachers had many manipulatives readily accessible in their classrooms as part of standard equipment. Graphing calculators were evident in mathematics classes visited at both the middle and high school. In spite of the abundance of materials, staff members did share some concerns with auditors related to staff development with manipulatives (see Finding 9) and equity in the availability of technology (see Finding 2).

Comments made to auditors about use of manipulatives included the following:

- "Many teachers do not know how to use manipulatives."
- "We don't use a lot of manipulative in the middle school."
- "One of the things we want to do next year is provide more training on the use of manipulatives. They use them, but not as well as they could."
- "We don't use a lot of manipulatives, and we don't use the computer lab much. A number of students—visual and kinesthetic—would benefit from those."
- "There is very little training on how to use math manipulatives, so they are used infrequently."

District personnel also expressed their expectations and concerns about availability of graphing calculators, which are an essential element of mathematics courses beginning with Algebra 1:

- "We could supply a classroom set of calculators, but when we get down to the homework problems we couldn't give them a calculator for homework."
- "The district started 20 years ago to purchase graphing calculators. Some schools have graphing calculators in their school stores and they rent them out for the year. Others may not have the graphing calculators. We have heard that some calculators may give some an advantage over others."
- "Schools have different approaches to buying calculators. All kids have access, but not equal access."
- "At our school every child is expected to have a graphing calculator."

In summary, auditors found that the use of basic instructional materials to support the teaching of mathematics in Montgomery County lacks focus. Buildings are free to choose from multiple texts, none of which are specifically aligned to curriculum guides. Purchase of textbooks and high printing costs for worksheets increases the expense of teaching mathematics. Schools are well supplied with manipulatives, but many teachers need inservice in how to use manipulative as tools to enhance learning. Not all students at the high school level have equal access to graphing calculators, which are a required in most high school courses.

Finding 13: Instructional Support Is Adequate, But Resources Are Not Allocated in Accordance with Need.

A productive and successful school system reflects a robust commitment to fair and equitable treatment of its clientele. Equity and fairness to all students are expected in all areas of school system operations including instructional support (materials, equipment, staffing, time, etc.).

The auditors found that the instructional support that has been provided is adequate, however, it is more equal than equitable. Most resources for teaching of math were observed in classrooms to be adequate (see Finding 12). In some cases, textbooks proliferated because of freedom of choice from several options which increases cost. The auditors reviewed data concerning instructional support provided to schools and found some inequities in instructional support that were localized to specific campuses and others that were apparent across the district.

Allocations and support for learning should be differentiated based on need sufficient to make a difference in closing gaps. Auditors found that there is insufficient differentiation in the allocation of resources between high-performing and low-performing schools. For example, one elementary school, Oak View receives $156 per pupil for instructional supplies to serve its low socio-economic population, whereas Beverly Farms receives $138 per pupil despite its wealthy and affluent clientele. Overcoming deficits in achievement will be extremely difficult unless allocations more adequately address differences in clientele (see Finding 2).

Through interviews and review of school budgetary costs, it was determined that building resources were based on a formula that provided equal per pupil allocation at each campus and were dependent upon the size of the student body, not the differing needs of the students.

A common measurement for level of need among student groups is the proportion of students who are in the low socio-economic category--generally those students eligible for free or reduced lunches. Auditors used the latest data available for free or reduced meals (FARMS) and site-based allocations (funding for "instructional supplies and other instruction support" only) data to prepare Exhibit 13.1, Exhibit 13.2, and Exhibit 13.3.

Exhibit 13.1
Funding
Montgomery County Public Schools
2000

Elementary School	% FARMS	Rank by Need	Site-based Instructional Support Allocations	Rank by Funds
Rolling Terrace	69.3	1	$109,980	1
Summit Hall	62.6	2	$80,979	7
Viers Mill	59.4	3	$90,489	2
Rosemont	56.4	4	$68,425	11
South Lake	44.6	5	$79,782	9
Twinbrook	43.3	6	$81,566	5
Strathmore	41.0	7	$67,865	12
Stone Mill	10.0	8	$88,971	3
Lois P. Rockwell	8.2	9	$70,782	10
Travilah	6.6	10	$72,882	8
Somerset	5.2	11	$55,323	13
Potomac	3.5	12	$84,934	4
Lakewood	1.8	13	$81,494	6

Source: Montgomery County Public Schools, 1999-2000 MCPS Schools At A Glance.

The first seven elementary schools in Exhibit 13.1 have in excess of 40 percent of their student body included in free and reduced meals.

The following observations are based on Exhibit 13.1 and information about district allocation of Instructional Support funds (instructional supplies and other instruction support).

- The elementary school ranked third in terms of fund allocations (Stone Mill) is eighth in terms of needs, and the elementary school ranked second in need for funding (Summit Hill) is seventh in terms of site-based funding.
- Two of the elementary schools ranked in the top seven in terms of need are 11th and 12th in terms of funding.

Exhibit 13.2
Middle Schools Ranked by Need and by Funding
for Instructional Supplies
Montgomery County Public Schools

Middle School	% FARMS	Rank By Need	Site-based Instructional Support Allocations	Rank by Funds
Parkland	50.8	1	$213,159	2
Eastern	42.3	2	$205,581	3
Argyle	38.7	3	$109,469	10
Sligo	36.4	4	$229,010	1
Benjamin Banneker	22.1	5	$170,900	5
William H. Farguhar	9.6	6	$145,499	7
Tilden	8.5	7	$169,864	6
John T. Baker	8.4	8	$139,971	8
Rocky Hill	8.4	9	$137,531	9
Robert Frost	3.3	10	$188,375	4

Source: Montgomery County Public Schools, 1999-2000 MCPS Schools At A Glance.

The following observations are based on Exhibit 13.2 and information about district allocation of Instructional Support funds.

- At the middle school level, Sligo is fourth in terms of need but first in terms of funds.
- Argyle is third in terms of need but the lowest in terms of funding.
- Robert Frost is the lowest in terms of need but fourth in terms of funding.

Exhibit 13.3
High Schools Ranked by Need and by Funding
Montgomery County Public Schools

High School	% FARMS	Rank By Need	Site-based Instructional Support Allocations	Rank by Funds
Wheaton	33.6	1	$293,468	10
Albert Einstein	25.9	2	$422,183	3
Montgomery Blair	24.0	3	$795,132	1
Springbook	22.4	4	$421,706	4
Rockville	19.1	5	$252,937	11
Quince Orchard	9.4	6	$417,005	5
Sherwood	6.7	7	$415,435	6
Damascus	4.3	8	$347,143	9
Poolesville	3.7	9	$228,792	12
Thomas S. Wootton	2.1	10	$381,817	7
Walt Whitman	1.7	11	$369,826	8
Winston Churchill	1.6	12	$438,770	2

Source: Montgomery County Public Schools, 1999-2000 MCPS Schools At A Glance.

The following observations are based on Exhibit 13.3 and information about district allocation of Instructional Support funds.

- The percentage of students receiving free or reduced lunch is smaller at the senior high school level. (Note: Eligibility needs are identified by student or family requests for services: senior high students may be reluctant to report their need.)
- Wheaton High School is ranked first in terms of need but are ranked tenth in terms of funds.
- Winston Churchill High School is ranked the lowest in terms of need, but are ranked second in terms of funds.

Comments from interviews with district personnel and board members confirmed that there is no systematic process to assure financial allocations based on needs:

- "We make very little distinction (when providing training) between schools with high needs and those with low needs." (central office administrator)
- "District started 20 years ago to purchase graphing calculators. Some schools have graphing calculators in their school stores and they rent them out for the year. Others may not have the graphing calculators. We have heard that some calculators may give some an advantage over others." (principal)
- "We need to create a level-playing field for everyone.... There are schools that do and those that don't – and (funding is) more than adequate if you are white and less than adequate if you are non-white." (administrator)

In summary, allocations of resources are inconsistent and seem to follow school enrollment patterns as opposed to the nature and needs of the schools' clientele. Without differential allocation of resources in accordance with need, the Montgomery County Public Schools will be unable to overcome achievement deficits of its low income, under-performing students.

IV. RECOMMENDATIONS OF THE PDK CURRICULUM MANAGEMENT AUDIT TEAM FOR THE IMPROVEMENT OF THE MONTGOMERY COUNTY PUBLIC SCHOOLS MATHEMATICS CURRICULUM.

Based on the three streams of data derived from interviews, documents, and site visits, the PDK Curriculum Management Audit Team has developed a set of recommendations to address its findings shown above in the audit.

In the case of the findings, they have been triangulated, i.e., corroborated with one another. In the case of the recommendations, those put forth in this section are representative of the auditors' best professional judgments regarding how to address the problems that surfaced in the audit.

The recommendations are presented in the order of their criticality for initiating system-wide improvements. The recommendations also recognize and differentiate between the policy and monitoring responsibilities of the board of education, and the operational and administrative duties of the superintendent of schools.

Where the PDK audit team views a problem as wholly or partly a policy and monitoring matter, the recommendations are formulated for the board of education. Where the problem is distinctly an operational or administrative matter, the recommendations are directed to the superintendent of schools as the chief executive officer of the school system. In many cases, the PDK audit team directs recommendations to both the Board and the Superintendent, because it is clear that policy and operations are related, and both entities are involved in a proposed change. In some cases, there are no recommendations to the superintendent when only policy is involved or none to the board when the recommendations deal only with administration.

Audit recommendations are presented as follows: The overarching goals for the Board and/or the Superintendent, followed by the specific objectives to carry out the overarching goals. The latter are designated "Governance Functions" and "Administrative Functions."

Recommendation 1: Restructure System Policies, Plans, and Actions to Provide Aggressive Action to Erase the Excessive Achievement Gaps Between Socio-economic and Ethnic Groups in Mathematics.

The Montgomery County Public Schools are faced with two monumental challenges: 1) bridging the gap between African American and Hispanic students and White students (see Finding 2). At the same time many are clamoring for the district to "raise the bar" to accommodate those who are succeeding; and 2) altering the perceptions of some that very little can be done to enhance the academic achievement of low-income and minority students (see Finding 2).

The success of African American and Hispanic students is further hampered by a variety of inequities and inconsistencies. These include inconsistent articulation from grade to grade (see Finding 3), wide latitude granted to teachers in choosing strategies and materials (see Finding 5 and Finding 13); a curriculum not supported by instructional materials, inadequate staff development (see Finding 9); and staff lacking in the ability to differentiate instruction to meet the needs of all students (see Finding 1). Program interventions are not research based creating fragmentation and inconsistency across the district (see Finding 10).

Tracking that begins in early years and an exaggerated emphasis on acceleration (see Finding 5) rather than enrichment place African American and Hispanic students at extreme disadvantage. Moreover, tracking ultimately results in the separation of students along socio-economic and racial lines (see Finding 1). Thus, a dual system in curriculum design and delivery permeates the district (see Finding 1). Solutions to the problems of low achieving minority and poor children - slowing

down the pace - further limits the possibility that these students will ever achieve at a high level (see Finding 1 and Finding 2).

Large organizations need to be very conscious of promoting equity and of being seen as agents of equity, particularly in the area of the resource allocation. Equal allocations in organizations responding to diverse needs, however, do not promote equity. School districts committed to overcoming the ill effects of inequity devise and implement strategies that create a climate of high expectations for all students regardless of race, gender, or home background. Instructional leaders monitor instruction to ensure that the delivery of instruction reflects a clear understanding of how children learn. The governing body supports the school sites in their efforts to work collaboratively with students and parents. Staff development is geared toward enhancing staff's beliefs in their skills and ability to reach all students.

The commitment to equal allocation of resources in Montgomery County Public Schools creates unequal access to programs, and runs counter to any attempts to foster equity. Allocations of resources are currently made according to enrollment (see Finding 1).

More importantly, the monitoring of instruction fails to result in the implementation of instruction that meets the needs of all students (see Finding 3 and Finding 9). School performance is not effectively tied to principals' job expectations or responsibilities. In general, the primary focus of the district is on what students are unable to achieve rather than asking why some students do not achieve and how the district can remove perceived barriers to high achievement.

Governance Functions: The following actions are recommended to the Montgomery County Public Schools Board of Education:

G.1.1: Review and revise existing policy to include a plan for ensuring the delivery of practices that assure equity and success in achievement for all.

G.1.2: Develop a set of policies that establish a framework for the development of goals, strategies, and expected outcomes to promote and sustain equity and consistency.

G.1.3: Direct the superintendent to identify roles and responsibilities among leaders and staff members for monitoring and contributing to the achievement of equity, and codify these in regulations.

G.1.4: Model assumptions and beliefs that are bias-free and that promote the enhancement of students' beliefs in their skills and ability to achieve, including the abolishment of pervasive homogeneous ability grouping.

Administrative Functions: The following actions are recommended to the Montgomery County Public Schools Superintendent:

A.1.1: Assist the Board in policy redesign described above.

A.1.2: Seek assistance from a broadly representative group to collaborate with the Board in developing a comprehensive, objective, and workable plan for achieving equity and consistency in all district operations.

A.1.3: Undertake a comprehensive effort to modify programs that are creating major issues impacting ethnicity and gender.

A.1.4: Modify course offerings and improve access to courses to enhance consistency and equity.

A.1.5: Direct appropriate personnel to facilitate coordination of programs, courses, and student activities to ensure educational opportunity.

A.1.6: Develop procedures and monitor the implementation of processes that foster comparability across school sites and grade levels. Select, adopt, and allocate instructional and human resources across schools to provide impact on schools in a consistent and equitable manner based on need.

A.1.7: Develop and implement a staff development program focused on enhancing the instructional leadership skills and abilities of staff. Staff development activities should concentrate on developing high expectations for all students and increase the skills of staff to deliver a curriculum that will bridge the gap between the ethnic groups. Monitor the use of appropriate strategies with periodic assessment of the effectiveness of staff development in increasing student learning.

A.1.8: Employ strategies that lead toward increasing the numbers of certificated staff in the area of mathematics.

A.1.9: Develop and implement a research-based program of instruction supported by staff development that capitalizes on the strengths of all students.

The Montgomery County Public Schools Board and Superintendent need to do whatever it takes to overcome the learning deficits of the under-performing students which comprise a substantial portion of its clientele. It is important to start with this coming year's kindergarten and first grades, and take whatever steps are needed to overcome the gaps in achievement.

Mathematics objectives must be monitored, and gaps or inadequacies must be dealt with earlier rather than later. Without prompt and vigorous attention to achievement deficits, the Montgomery County Public Schools will continue to fail in delivering uniform and consistent success in mathematics instruction. Moreover, the use of ability grouping in mathematics which results in no demonstrated advantage in learning achievement, but does deliver racial and economical segregation in effect, is a practice that must be terminated if the system is serious about comprehensive and complete success for its entire student clientele.

Recommendation 2: Restructure System Policies to Provide the Framework to Remove Achievement Gaps Between Ethnic and Socio-economic Groups.

The most serious problem facing the Montgomery County Public Schools is the achievement gap between children of lower, middle, and upper income levels and among racial and ethnic groups. Because race and socio-economic status are interrelated, it is a matter of eliminating practices that lead to an achievement gap between majority and minority students. The problem has been of great duration in the Montgomery County Public Schools, and it is reflected in board statements and goals. Yet the problem remains and persists. Few are being served adequately under the present conditions. The growing achievement gap is testimony to the lack of success with minority children.

The schools remain the best hope to deal with patterns of low achievement which persist in the community. It is recommended that the achievement gap, which currently exists based on socio-economic factors and race, be addressed and eliminated.

A comprehensive set of policies is necessary for effective curriculum management. Without definitive policies, the district cannot ensure program focus, effectiveness, or consistency. It is critical for the Montgomery County Public Schools to give attention to the revision, development, and use of policy related to curriculum management.

Most policies required for effective curriculum management are either inadequate or missing. Currently, Montgomery County policies fail to direct many critical functions for curriculum design and delivery. Policies are missing that would provide direction for establishing a high-quality curriculum scope and development; equitable curriculum delivery; productive staff development; assessing and gaining feedback on the productivity of system efforts; and developing and managing a program-driven budget (needs-driven allocation system).

Governance Functions: The following actions are recommended to the Montgomery County Public Schools Board of Education:

G.2.1: Direct the superintendent to develop a draft curriculum management policy that meets the 22 criteria for control, direction, equity and consistency, feedback, and productivity as presented in Appendix B. A sample policy is found in Appendix D.

G.2.2: Review, critique, and adopt this policy by November 1, 2000.

G.2.3: Direct the superintendent to implement and monitor this policy and provide assessment reports to the Board on policy implementation and effectiveness.

G.2.4: Create a Citizens Task Force that is broadly representative of the composition of the community and its schools, which will assist the Board in developing a comprehensive objective and thorough policy framework, which will end the achievement gap based on socio-economic status and race.

G.2.5: Establish high expectations for all students to achieve and authorize by policy the administration to take whatever steps are necessary to change any practice that inhibits the system's response to the elimination of the gap, without lowering any achievement ceilings or expectations.

G.2.6: Require annual reports from each school as to the progress made in closing the achievement gap between student groups.

Administrative Functions: The following actions are recommended to the Montgomery County Public Schools Superintendent.

A.2.1: Locate the achievement gaps by school and grade levels. Assign each principal to allocate resources including teachers, time for learning and assignment of aides to increase the learning of children from lower socio-economic backgrounds. Begin the process in kindergarten, grade six, and grade nine the first year of implementation. Especially at kindergarten in moving to first grade, keep the gap closed. Vary instructional methods, time-on-task, and allocation of resources to accomplish the objective. Create additional opportunities for learning through innovative use of instructional time, such as: block scheduling, Saturday school, an extended school day, special summer sessions, and/or learning summer camps.

A.2.2: Complete Board directive per Action G.2.1 and facilitate board activities during this policy review, critique, and adoption process. A sample curriculum management policy is provided in Appendix D.

A.2.3: Implement and evaluate the adequacy of the policy and the effectiveness of staff in following the policy, provide staff training as needed, and provide yearly reports to the Board on policy implementation and administration effectiveness.

A.2.4: Change the budgeting process to enable effective programs to attract more resources in order to eliminate the achievement gap. Assure that resource allocations follow school differences in the level of criticality of learner needs.

A.2.5: Enlist the support of parents to reinforce with their children the need to increase time-on-task in order to close the gap and keep it closed.

A.2.6: Design and implement focused staff development, designed to create practices and procedures that close the achievement gap (see Recommendation 5).

A.2.7: Create and staff a monitoring system that will provide principals, program administrators, and the Board of Education with accurate, complete, and timely reports on progress toward closing the achievement gap. The system must be able to identify starting and ending levels of achievement at each grade level and semester and then be used to make changes in staffing, activities, interventions, leadership, and other factors affecting achievement.

A.2.8: The second year of implementation needs to focus the system's work on closing the gaps in grades 2-3, 7, and 10. The third year focuses on grades 4-5, 8, and 11-12. If the gap is closed in kindergarten and first grade and remains closed, it will be eliminated in thirteen years.

The auditors found in their interviews that many principals and teachers believe the system to be out of control. The burden of implementing changes in the schools falls upon the same persons. It is important the Board and the Superintendent take steps to involve and listen to and work to weave staff together patterns of common interest into a change agenda that unites the community around the needs of its public school system in accordance with a strong and sensible policy framework.

Recommendation 3: Redesign and Implement a Comprehensive and Aligned Curriculum and Program Management System to Provide for Consistency and Continuity in Student Learning and Staff Development and Improvement of Teaching.

It is essential that challenging student-learning objectives in mathematics become a major component of the curriculum and program management system in the district. The Montgomery County Public Schools are committed to high expectations for student learning. Also, a focus on the attainment of "success for every student" is a priority within the district to improve the level and quality of learning for all children (see Finding 1).

Effective instruction is crucial to improving student achievement in every classroom. High-quality staff development programs are essential for creating environments where students and staff are considered learners. Staff development, although extensive, is ineffective in focusing on instructional priorities related to mathematics (see Finding 9).

Curriculum quality requires a complete set of curriculum guides that are functional, easy to use, and set high expectations for all areas of the curriculum. Quality curriculum objectives incorporate higher-level thinking skills, integrate emerging curriculum trends, the requirements from the state, and a challenging set of skills and knowledge bases needed by young people as they move into algebra and higher-level mathematics.

At the time of the audit, a comprehensive curriculum and program management system to provide consistency and continuity and a level of quality control was absent (see Finding 5). Policies that establish a philosophical framework to direct the design and delivery of the curriculum were also absent (see Finding 4).

Written curricula are available for all mathematics courses and subjects taught; however, many of the curriculum guides are not of sufficient quality to translate into daily lesson plans or community efforts among and between schools (see Findings 5 and 6). Assessment practices are not aligned with student learning objectives (see Finding 7).

There is an abundance of mathematical instructional materials, but multiple textbooks prevent a system focus upon mathematics instruction (see Finding 12). Building priorities and services often vary from school to school (see Finding 3). Throughout the district, resources were more equal than equitable (see Findings 2 and 13).

Principal monitoring of the curriculum is generally ineffective (see Finding 8). Current supervisory staff is competent, but spread too thin to effectively "make a difference" (see Finding 11). Interventions for increasing student achievement are not systematically planned and designed for long-term effects (see Finding 10).

Governance Functions: The following actions are recommended to the Montgomery County Public Schools Board of Education:

G.3.1: Adopt the following policies to provide the framework for a comprehensive curriculum management process (see Finding 4 and Recommendation 2):

- A policy that describes the district's philosophical approach to staff development and curriculum and instruction as well as its approach to mathematics instruction.
- A policy that requires the alignment of the written, taught, and tested curriculum (see Finding 6).

- A policy that specifies the procedures for the design, implementation, evaluation, and revision of the mathematics curriculum, including a cycle of curriculum review (see Finding 5).
- A policy that assigns responsibility for and includes procedures for monitoring the delivery of the mathematics curriculum (see Finding 8).
- A policy that focuses staff development on the individual needs of teachers, administrators, and program requirements (see Finding 9).
- A policy that allocates resources to buildings or campuses based on need (see Finding 13).
- A policy that establishes a consistent format (using audit criteria) for the design of quality curriculum guides (see Finding 5).

G.3.2: Direct the superintendent to develop a written curriculum for mathematics within a multi-step process that includes strategies, resources, and assessments that are clearly tied to both state and local expectations. The curriculum should be aligned with both state and national standards and be reasonable, focused, and well articulated from one grade level to the next (see Finding 5 and Finding 6).

G.3.3: Direct the superintendent to develop procedures for selecting no more than two textbooks per grade level or course that are highly aligned with the local curriculum and specifically referenced in all curriculum documents (see Finding 5 and Finding 12).

G.3.4: Direct the superintendent to develop an assessment plan that is reasonable, manageable, and provides feedback for decisions on design and delivery of curriculum, evaluation of programs, and information on individual student progress (see Finding 6, Finding 7, and Recommendation 4).

G.3.5: Direct the superintendent to restructure and redefine administrative roles, staff responsibilities, and functions in instructional supervision for improvement of the mathematics curriculum and instruction (see Finding 11).

G.3.6: Commit financial resources to the development of a comprehensive curriculum approach to mathematics and training to assist staff in designing and implementing a quality curriculum for mathematics. Ensure that there is adequate district staff to orchestrate this function and that staff members have adequate training to carry out their supervisory tasks.

Administrative Functions: The following actions are recommended to the Montgomery County Public Schools Superintendent:

A.3.1: Assist the Board in the development of the recommended policies.

A.3.2: Develop a comprehensive curriculum management process to include the following elements:

- The district's philosophical approach to mathematics instruction;
- A curriculum review cycle for mathematics;
- A consistent curriculum guide format based on audit criteria;
- Delineation of roles and responsibilities for curriculum-related decision-making for district administrators, principals, and teachers;
- Instructions for monitoring the curriculum that include specific procedures and criteria for principals and other staff;
- Timing, scope, team membership, and procedures for curriculum review and adoption;
- Selection procedures for instructional resources;
- A process for integrating technology into the curriculum; and
- A process for communicating curricular revisions to the school board and staff.

A.3.3: Develop a district-wide, K-12 assessment plan that incorporates administration and use of feedback from the following (see Finding 7, Finding 8, and Recommendation 4):

- Assessments mandated by the state.
- Criterion-referenced tests--Establish a schedule for tests (quarterly administration is suggested) across all grade levels and subjects, including end-of-year exams if the district deems those to be valuable. Create tests that can be given within a class period and scored electronically, with a short turn-around time for results. Results to schools should provide feedback about individual objectives by teacher, school and system, as well as information regarding performance of individual students.
- Ongoing classroom assessments--Provide staff development for classroom teachers in creation and use of sound classroom assessments that match county learning objectives and that provide students with practice in a variety of assessment formats.
- Scheduling of assessments should be such that no one grade level devotes an undue amount of time to assessments of any type from any subject area; likewise, no grading period should have an excessive amount of time spent in testing.
- Assess the written curriculum using the following components (see Finding 5):
  - Consider the learner outcomes and mathematical strands (i.e., geometry, measurement, numbers and number concepts). These strands and the outcomes within provide the framework for curriculum planning.
  - List topics or units in mathematics that students work on every day. The way in which most mathematics textbooks are organized, as well as the way many teach mathematics, is through a series of topics or units or strands, rather than learner outcomes.

    For example, in a typical 7th grade mathematics text, the chapters concern: addition and subtraction; multiplication and division; multiplication and division of decimals; graphing and statistics; geometry and measurement; addition and subtraction of fractions; multiplication and division of fractions; integers and rational numbers; ratio, proportion, and percent; geometry; area and volume; algebra and coordinate geometry; and probability.
  - Create a curriculum map:

    Across the top of the matrix will be listed all the mathematical strands as well as a column for the learner outcomes and units or topics in the mathematics book. Down the left-hand side will be listed all the topics or units in the textbook as well as the page numbers to locate the textbook topic as well as the corresponding learner outcome.
  - For each topic within the text, one should consider which of the outcome(s) and strand(s) the topic addresses and place an "X" in the corresponding box.
  - An example of the curriculum/assessment planning guide for mathematics will look like the following:

Textbook Unit or Topic	Page #	Learner Outcome	Number and Operations	Algebra	Geometry	Measurement	Data Analysis and Probability

    What results from this process is a map of the curriculum, demonstrating the ways in which the different mathematical strands and ensuing learner outcomes are addressed in each of the topics or units within the curriculum. The map is used to define which topics or concepts in a curriculum may be used to help students acquire the knowledge and skills inherent on the MSPAP and within the core learning outcomes. If the map shows that some of the outcomes are not adequately addressed by the mathematics text, then some adjustments must be made.

Once the curriculum map has been produced, one must determine how each of the topics can be assessed. Both traditional and performance measures should be developed to reflect items on the MSPAP and Core Learning Outcomes.

A.3.4: Establish and implement a curriculum review cycle that includes the design of curriculum guides (see Finding 5):

1. Organizational preparation:
   - Select a consistent, district-wide format for curriculum guides that includes audit criteria, is functional, and user-friendly.
     - Front Matter: Cover page, district information (i.e., board members, senior officers), acknowledgments of designers, table of contents.
     - How To Use This Guide: Statement of purpose of the guide, how to use the guide, how the guide is organized, and glossary of terms and acronyms.
     - Orientation to the Curriculum: Statement of philosophy of the mathematics curriculum, *Maryland Learner Outcomes (MLO), Core Learning Outcomes*, themes and strands (if appropriate), presentation of spiraling aspects of the curriculum, listing of major resources, listing of formal assessments, time allocations, instructional teaching-learning models that will be used.
     - General Information Regarding the Discipline Area: Beliefs and underlying research within the discipline as well as strategies for teaching the discipline.
     - Scope and Sequence: Across levels and courses.
     - Guide Sheets.
   - Develop a timeline for mathematics curriculum development that allows all aspects of the process -- original curriculum writing, field-testing, revisions, and development of assessments -- to be completed within a relatively short period of time rather than the nine-year time frame that the current proposal for elementary revision proposes. Then stick with the timeline (see Finding 11).
2. Design curriculum:
   - Develop a set of well-articulated standards, aligned with both the NCTM's Standards and those for the State of Maryland, that provide a consistent K-12 umbrella for all student objectives in every course at every grade level (see Finding 6).
   - From those standards, develop a reasonable and manageable set of objectives for each grade level K-8 and for all individual courses at the secondary level. The objectives should include both mastery objectives for each grade level and introductory material for the next grade level. Objectives should be clearly aligned with indicators from MSPAP at grades K-8 and Core Learning Goals at the high school (see Finding 6).
   - Analyze the results of the third, fifth, and eighth mathematics section on the MSPAP (see Finding 7). Use this information to strengthen the curriculum.
   - Align instructional and performance objectives with the learner outcomes. Then, align specific MSPAP test questions to the instructional and performance objectives that reflect the learner outcomes (see Finding 6 and Recommendation 3, Action A.3.10).
   - Identify fundamental mathematical components and ideas within the theorems of arithmetic, algebra, and calculus (i.e., rate, accumulation, and function) in grades kindergarten through eighth grade that prepare students for algebra and higher level mathematics courses. State ideas/components within instructional objectives and outcomes (see Finding 5).
   - Develop the ideas/components of the fundamental theorems in each course within problems and activities (i.e., extend objectives through the development of problems and activities that help students synthesize key components and ideas of the theorems).

- Determine prerequisite skills or concepts needed to learn the objectives that are aligned to the *Maryland Learner Outcomes* and *Core Learning Outcomes*.
- Look at the vertical progression of key components and ideas of the fundamental theorems of arithmetic, algebra, and calculus as students move from course to course.
- Match objectives with textbooks and supplementary instructional resources.
- Integrate instructional technology.
- Develop specific examples and model lessons on how to approach key concepts or skills in the classroom, including a variety of techniques.
- Align instructional strategies with instructional and performance objectives that reflect the state's learner outcomes and core learning outcomes.
- Include strategies for meeting the needs of special education and gifted students.

3. Implementation:
   - Field-test the curriculum.
   - Pilot the resource material, assessments, and instructional strategies.
   - Focus on mathematical activities (in text and developed by teacher) that address instructional and performance objectives that reflect learner outcomes and are assessed in ways reflective of the items found on the MSPAP.
   - Evaluate the curriculum's effectiveness in terms of student achievement.
   - Revise field-tested curriculum guides based on feedback.
   - Submit curriculum for adoption to the Board.
   - Remove outdated curriculum guides from the schools and district catalogs, etc.

A.3.5: Develop a system for selecting textbooks that are tightly aligned with the local curriculum and allow smooth transitions for highly mobile students (see Finding 12). The following elements should be a part of the adoption system:

- Considerations in selection of textbooks should include content, assessments, and instructional support for teachers. A high percentage of local curricular content should be found in any selected textbook. In addition, assessments included in the textbook and supplemental materials should be in a variety of formats that familiarize students with items they would encounter in future high-stakes assessments, (i.e. multiple-choice, short answer, and performance assessments with rubrics).
- The number of approved textbooks per grade level or course should be limited to no more than two; one per grade level or course would be ideal. Limiting the number of textbooks has several advantages, including the following:
  1. District students who are highly mobile do not have to adjust to different textbooks as they move from one building to another.
  2. The work of supporting one textbook is much less than that of supporting several.
  3. Huge savings would accrue to the district as a result of the volume of purchase.
  4. A good deal of staff development could be negotiated from publishers.
- Reference specific chapters, sections, or pages from each approved textbook with the appropriate learning objective in the curriculum guide for each grade or course.

A.3.6: Create supplemental instructional units for those objectives in district curriculum that are not covered by the selected textbook. Clearly reference these units in the curriculum guides and make the units readily accessible to teachers.

A.3.7: Use the following procedure in making the guides "user friendly."

- Place guides in three-ring binders, on disc, etc.

- Color code or tab different sections.
- Use a writing style that uses transitions and introductions for each section, provides a place for hand written notes, uses boxes and post-it type parts in the format, uses lots of bullets and outline type style, and uses the same font, type of type, etc. throughout the guide.
- Include a lesson plan form for those users who desire a lesson plan format approach.

A.3.8: Oversee the development and implementation of a mathematics staff development program (see Recommendation 5) that is focused on the individual needs of teachers, administrators, and program requirements which:

- Provides a framework for integrating innovations related to the district's mission and goals;
- Has a staff development mission in place for mathematics education;
- Is built using a long-range planning approach to mathematics education;
- Is designed for all mathematics staff and supervisors;
- Expects each supervisor of mathematics to be a staff developer of staff supervised;
- Requires careful analysis of data and is data-driven;
- Uses research-based approaches that have shown to increase mathematics achievement and productivity;
- Provides for three phases of the change process: initiation, implementation, and institutionalization;
- Is based on knowledge of adult learning;
- Utilizes a variety of staff development approaches to mathematics instruction;
- Provides follow-up and on-the-job application necessary to ensure improvement in mathematics education;
- Includes an evaluation process that is ongoing, including multiple sources of information, focuses on all levels of the organization, and which is based on actual changed behavior; and
- Provides for system-wide coordination with a clearinghouse function.

A.3.9: Establish administrative regulations for developing, adopting, implementing, and monitoring programs and interventions that are aligned to the priorities within the mathematics curriculum (see Finding 10). Include the following:

- Designate an administrator to supervise a clearinghouse function for the adoption and review of all programs and interventions related to mathematics. All programs must show alignment to the curriculum and evaluated each year for effects upon student achievement.
- Establish a screening or application process for the adoption and renewal of mathematical programs and interventions. Develop a program and intervention screening process that includes:
  - A statement of alignment with the district's common curriculum;
  - A description of the program and/or intervention;
  - An evaluation of all program and instructional approaches for equity and gender bias;
  - A description of strategies that are congruent with district philosophy;
  - A list of required resources and funding sources as well as long-term funding;
  - A budget (i.e., cost per pupil);
  - An evaluation design; and
  - A set of criteria for renewal.
- Review and align current programs and interventions related to mathematics. Using the new screening process criteria, current programs and interventions need to be reviewed and

prioritized. Ineffective or misaligned programs need to be eliminated. Eliminate programs that are not positively impacting mathematics student achievement. Maintain a current list of programs and interventions.

- Implement a clearinghouse for program and intervention adoption, monitoring, review, and enhancement/elimination. Principals need to be directed to seek approval for all site-based programs through the clearinghouse. Under the direction of an administrator, the clearinghouse will check on the following:
  - Innovative program designed to solve a problem;
  - Problem analysis conducted which included data review and needs assessment;
  - Overall goals are stated and linked to district as well as campus objectives;
  - Program inputs identified;
  - Program activities specified;
  - Rationale written for linking activities to solving problems;
  - Program costs identified;
  - Program results stated yearly;
  - Program evaluation procedures specified (both formative and summative);
  - Program results linked to reduction of problem;
  - Yearly reports submitted to school councils and central administration; and
  - Continuation of program linked to school council recommendations and incorporated in school improvement plan.

A.3.10: Develop a system for monitoring curriculum implementation throughout the district (see Findings 3 and 8). Provide training in instructional coaching to monitor the curriculum for principals and supervisory staff. Principals should see that the curriculum is being taught in the classrooms by observing and working in classrooms, conducting a walk-through in classrooms, participating with teachers in problem-solving regarding curriculum and instruction, and facilitating teacher reflection and feedback.

The following is recommended for the structure of the observation by the principal:

- Specify time-on-task (how many students in room are on-task, off-task when observed);
- Determine the curriculum objective that is being taught in the classroom and the cognitive level according to Bloom's Taxonomy;
- Compare taught objective to district curriculum guide for congruence when you return to office;
- Determine content alignment of activities/resources to the objective(s) being taught. In addition, check for contextual alignment to district or state assessments;
- Determine effective teaching practices taking place (i.e., on-task behavior, guided practice with check for understanding, meta-cognition and/or modeling, error rate, student awareness of objective);
- Determine if teaching practices are aligned to both content and contextual items on district and/or state assessments;
- Specify other objectives and teaching practices observed on walls, charts, chalkboard, centers, etc.;
- Determine amount of student work displayed; and
- Plan when you will give feedback to teacher on observation - either written or oral and whether feedback is given in the form of a direct statement or a reflective question about what was observed.

A.3.11: Create a staffing plan that supports design and delivery of a strong mathematics program, with increased staff at both the district and building level. Write specific job descriptions that delineate the responsibilities for each position, limiting the responsibilities to tasks that specifically support mathematics and student learning of mathematics (see Finding 11).

A.3.12: Distribute resources (financial and human) to campuses on the basis of need rather than equal per-pupil allocations (see Findings 1, 13, and Recommendation 1).

A.3.13: Provide sufficient financial resources within the budget process to accomplish the design of the revised curriculum and the staff necessary to support the process.

Given the commitment of the Montgomery County Public Schools to remedy the inadequacies of the math program by focusing on improved quality of curriculum and instruction with appropriate staff development and support, the success of student learning will increase. With equity and allocation of resources (human and materiel) based upon needs, the gaps in achievement between groups will be ameliorated accordingly.

Success will be driven in large part by the level of alignment between what is taught and what is assessed. Teachers in Montgomery County need to structure their limited instructional time around the essential learning expectations reflected in the Maryland tests and standards in order to maintain adequate achievement for all students in the county.

Recommendation 4: Make Better Use of Assessment Data for Instructional Improvement and Staff Development Planning Through Refinement of the District's Comprehensive Assessment System to Focus on Use of Data for Instructional Decision-making and Improved Achievement of All Students.

The Montgomery County Public Schools need to develop a plan for making better use of assessment data to address the staff development and training needs of teachers, principals, and staff so that they can improve the design and delivery of instruction to promote the achievement of all students. A comprehensive assessment plan that includes use of student assessment and program evaluation data is needed to ensure alignment between the written and tested curriculum and to better connect what students are taught to items on which they will be tested. Development of a comprehensive feedback system and implementation of a plan for cyclical evaluation of programs that support the curriculum workplan is critical. The following issues should be addressed:

There is a need to prioritize testing analysis and interpretation as a tool to increase the capacity of school administrators and teachers to use assessment data to improve instruction (see Finding 7). Student achievement overall is above state and national averages (see Finding 7). Though some principals report they have received training on test data analysis and interpretation and instructional monitoring, there is no comprehensive, focused staff development to provide direction or linkage to the district's instructional priorities in terms of improved student achievement (see Finding 9).

Board policy deficits result in lack of control for effective mathematics curriculum and instruction. Board expectations are not clearly stated in policy for system direction. The development, use and oversight of learning expectations are inadequate (see Finding 4). Monitoring of the curriculum at the building level is inadequate and unproductive (see Finding 8). Though the mathematics curriculum is adequate in scope, it is inadequate in quality for teacher direction and support. Teachers have wide latitude in choice of strategies and materials, which weakens integrity through fragmentation. Though mathematics content of the Maryland Learner Outcomes has been aligned with the school district's ISM, there has been no alignment of the context of the two (see Finding 5). This results in fragmentation in instructional direction and lack of clarity on what assessment data is important. This disconnect contributes to the finding that data are not used consistently to improve instruction (see Finding 7).

Mathematics curriculum alignment has not been established or empirically confirmed. Mathematics textbook alignment and sequencing with curriculum is inadequate (see Finding 6). Curriculum management planning is informal and lacks clear direction for the development, implementation, monitoring, and evaluation of the educational program (see Finding 4). Staffing in mathematics supervision is inadequate and weakens the quality of mathematics program design and delivery. Duties of mathematics specialists in curriculum design and assessment development conflict with other priority needs (see Finding 11).

Assessment data are ineffectively used in decision-making (see Finding 7). While the scope of assessment is broad and is adequate to monitor student performance and though student achievement overall is above state and national averages, wide differences can be observed in average student performance when overall assessment data have been disaggregated by school and grade level (see Finding 7). The district has developed criterion-referenced mathematics assessments for grades 3 through 8 and for algebra 1A and geometry, which should lead to deeper curriculum alignment between the tested and written curriculums. Decisions regarding the future role and function of the Instructional System in Mathematics (ISM) need to be made. Either the ISM needs to be updated, more closely aligned with the Maryland Learning Outcomes, and fully aligned with the MSPAP and district criterion-referenced mathematics tests, or it needs to be abandoned in favor of a curriculum and assessment management system that is aligned deeply to the Maryland Learning Outcomes, CRTs, and MSPAP. An emphasis needs to be made on deep alignment (strong connection between curriculum taught and test content and context) of the curriculum using a process that involves taking assessment data, disaggregating the results, analyzing the content and context of what is taught with what is tested, and reconnecting what is taught with the content and context of the curriculum with what is tested.

Assessment data should be used appropriately for the purposes for which it was intended. Grouping by ability is common in the Montgomery County Public Schools, but the district that supports its use as successful practice has provided no empirical evidence in its justification. This de facto tracking creates separation of groups, which inevitably falls out along racial lines. Tracking results in duality of curriculum (see Finding 1) and leads to grading systems that do not reflect true student performance because of perceptions of grade inflation or grades that do not mean anything (see Finding 7).

Coordinated leadership and clear responsibility for instructional management and monitoring will help to eliminate fragmentation that exists because of the absence of a comprehensive assessment system. An adequate assessment system and focused plan that includes a cycle for evaluating instructional programs and delivery systems ensures that assessment data are used effectively to improve student achievement. The comprehensive assessment system must be aligned with the curriculum management plan to impact the design and delivery of the curriculum and staff development (see Recommendation 3).

The district should continue to build the capacity of staff to interpret test results and apply analyses for instructional improvement. Emphasis needs to be placed on the training of principals, but should also be extended to teachers. Strengthening and coordinating staff responsibility for testing analysis, data interpretation and program evaluation can increase the productivity of the district. Focused leadership and direction for accountability provides the Board, principals, teachers, parents, and the public with more reliable information regarding the effectiveness of the Montgomery County Public Schools. It also aids district and school administrators in diagnosing and acting on curricular programs, provides teachers with useful data for adjusting instruction, and gives students and their parents' useful information regarding student learning.

An adequate feedback and assessment system would include the following features:

- Strong accountability leadership that reports to the superintendent or other high level administrator;
- Board policy that effectively directs how data should be used to improve educational practice;
- Scope of testing program that is adequate in relation to the grades and subjects taught;
- Assessments that control for bias and are valid and reliable measures of student achievement;
- A planning matrix that indicates assessment tools, purposes, subjects to be assessed, type of student tested, and timelines to be used for implementation;
- Clear, delineated roles and responsibilities of the Board, central office staff, and school-based staff;
- Clear relationship indicated between district and state assessments;
- An ongoing training plan for various audiences on assessment analysis and interpretation exists and is operational;
- A cycle for program evaluation has been agreed upon with results used to make curriculum and program decisions;
- Alignment of state and local tests with the curriculum with a clear delineation of where gaps exist;
- Test results are used effectively to diagnose and improve curricula;
- A communication plan for the student assessment process is operational;
- Ongoing evaluation of the assessment plan takes place; and
- Budget ramifications of instructional decisions are connected to resource allocations.

The current feedback and assessment system in the Montgomery County Public Schools can benefit by implementing all of the features of an adequate feedback and assessment system.

Governance Functions: The following actions are recommended to the Montgomery County Public Schools Board of Education:

G.4.1: Direct the superintendent to develop a draft policy for board critique, review, and ultimate adoption to include a framework for a comprehensive, up-to-date feedback and assessment system aligned with the mathematics curriculum, which will provide a purpose, scope, and direction for testing, program evaluation and the use of data produced.

G.4.2: Direct the superintendent to develop a draft policy for board critique, review, and ultimate adoption that specifies mathematics programs and projects to be evaluated on a periodic basis.

G.4.3: Use program evaluation data in making decisions regarding program revision, expansion, and termination.

G.4.4: Direct the superintendent to design a plan for comprehensive assessment and evaluation of mathematics programs and projects for board critique, review, and ultimate adoption in board policy and administrative regulations that provides data on student achievement and program efficacy.

G.4.5: Direct the superintendent to develop a draft policy for board critique, review, and ultimate adoption a process and timelines by which staff must report to the Board and community on progress towards district and school student mathematics achievement goals.

G.4.6: Direct the superintendent to provide for board review student assessment data for use when making budget and other programmatic decisions.

G.4.7: Use student assessment data when making budget and other programmatic decisions so that funds will be properly allocated to support identified district program priorities.

Administrative Functions: The following actions are recommended to the Montgomery County Public Schools Superintendent:

A.4.1: Comply with board directives.

A.4.2: Design a comprehensive assessment and feedback plan that meets the criteria of the audit.

A.4.3: Clarify the roles, responsibilities, and authority of mangers responsible for implementing the comprehensive assessment plan including the provision of timely, disaggregated student assessment data, and training on data use for instructional improvement. Instructional managers should have responsibility for generating disaggregate assessment data, providing direction on the process to be used in guiding deep alignment of assessment with the curriculum and state standards, and should oversee program evaluation activity whether conducted internally or via contract externally. This action may involve redefinition of current responsibilities of some staff or selection of new staff to ensure that there is an administrator with day-to-day responsibility for instructional improvement through accountability.

A.4.4: Ensure that existing policies for program evaluation are implemented.

A.4.5: Require that established mathematics programs are data-driven, integrated and cohesive to ensure continuity and effectiveness.

A.4.6: Prioritize mathematics programs and projects to be evaluated and establish timelines for reporting evaluation results.

A.4.7: Require that the responsible department develop an action plan to address the recommendations generated from program evaluation or student assessment data.

A.4.8: Require that the recommendations from program evaluations with accompanying action plans be submitted to the Board through the superintendent in a timely manner not to exceed 90 days after completion.

A.4.9: Hold responsible the departments accountable for following up on the recommendations and making progress reports through the superintendent to the Board.

A.4.10: Require that the district and schools consistently use quantitative and qualitative information in developing school improvement plans.

A.4.11: Require the use of formative and summative assessment for mathematics program development and implementation.

A.4.12: Decide on the future role and function of the Instructional System in Mathematics (ISM). One option for the ISM is to update it, align it more closely with the Maryland Learning Outcomes, and fully align the ISM with the MSPAP and district criterion referenced mathematics tests. Another option is to abandon the ISM in favor of a curriculum and assessment management system that is aligned deeply to the Maryland Learning Outcomes, CRTs, and MSPAP.

A.4.13: Provide training for principals to strengthen their skills in assessing the extent to which an aligned curriculum is being taught by teacher. Require that principals monitor instruction to ensure curricular alignment.

A.4.14: Document and share with staff the extent to which the district mathematics curriculum reflects the alignment of state learning outcomes/goals, the mathematics criterion referenced assessments, MSPAP mathematics performance assessments, and other relevant assessment measures.

A.4.15: Monitor the training for teachers provided by principals and others on assessment at their respective school sites. A school-based testing committee should take the lead in providing training to other teachers on interpreting and using assessment data.

Without a strong system of assessment that provides feedback for decision-making, the testing system in place merely will reflect the socio-economic nature of the Montgomery County Public

Schools clientele. Feedback which illustrates the level of achievement obtained by an individual student, classroom, teacher, grade level, program intervention, school, or district is enormously useful in modifying, confirming, or terminating services, activities, strategies, materials, training practices, and ultimate success. Without the extensive gathering and appropriate use of feedback, the system will continue to be unable to rectify its shortcomings in mathematics education.

Recommendation 5: Redesign and Implement a Comprehensive and Aligned Staff Development Effort to Better Prepare Teachers for Improvement of Teaching Mathematics.

Teachers were found to be under-prepared in many cases to teach mathematics, and several math teachers were found that were teaching without benefit of mathematics licensure and certification. Considerable confusion was also found by the auditors in terms of what teachers were expected to teach and how they were supposed to teach it. Methods and strategies varied widely, as did materials, content and contexts, and special programming.

The Montgomery County Public Schools need to develop greater continuity across the system in the area of mathematics instruction by designing, developing, and implementing a sound and effective staff development effort which will upgrade teacher skills, improve the content of teaching, and better align student learning with what needs to be taught.

Governance Functions: The following actions are recommended to the Montgomery County Public Schools Board of Education:

G.5.1: Review with the superintendent the staff development philosophy and establish a particular approach to staff development. Clarify the district's approach to staff development design, delivery, and assessment. Place these decisions in policy.

G.5.2: Establish policy that sets the parameters for the implementation of a comprehensive staff development system that provides for the professional development of the individual, the overall improvement of schools, and the effective functioning of the entire district.

G.5.3: Adopt the following policies to provide the framework for a comprehensive staff development process (see Finding 4):

- A policy that describes the district's philosophical approach to staff development as well as their approach to mathematics instruction.
- A policy that staff development priorities need to address the district's mission and goals.
- A policy that requires staff development when the individual is not performing up to expectations.
- A policy that focuses staff development on the individual needs of teachers, administrators, and program requirements.

G.5.4: Direct the superintendent to assess the effectiveness of the staff development in terms of student achievement.

G.5.5: Adopt a policy that establishes a consistent format (using audit criteria) for the design of effective staff development training.

G.5.6: Commit financial resources to the development of a comprehensive staff development approach to mathematics and training to assist staff in meeting the Success for Every Student building plan and the individual staff professional growth plan.

Administrative Functions: The following actions are recommended to the Montgomery County Public Schools Superintendent:

A.5.1: Assist the Board in the development of the recommended policies.

A.5.2: Assess the current staff development program on the basis of student achievement data as addressed in the Maryland School Performance Assessment Program (MSPAP) (see Finding 7). Use

this information to strengthen the staff development program. Hold staff accountable for training to improve their instruction in order to meet the goals of the SES plans and raise student achievement scores for all students.

A.5.3: Design and implement comprehensive mathematics staff development focused on individual needs of teachers, administrators, and program requirements which:

- Describes a relevant policy which directs staff development efforts;
- Provides a framework for integrating innovations related to the district's mission and goals;
- Has a staff development mission in place;
- Is built using a long-range planning approach;
- Fosters a norm of continuous improvement and a learning community;
- Provides or organizational, unit, and individual development in a systemic manner;
- Is designed for all employees and assures adequate teacher competence in mathematics content and context;
- Expects each supervisor to be a staff developer of staff supervised;
- Focuses on organizational change and staff development efforts to be aligned with district goals;
- Requires careful analysis of data and is data-driven;
- Insists on proven research-based approaches that have shown to increase productivity;
- Provides for three phases of the change process: initiation, implementation, and institutionalization;
- Insists on designed training based on human learning and development and adult learning.
- Proposes the use of a variety of staff development approaches;
- Requires staff development that provides follow-up and on-the-job application necessary to ensure improvement;
- Requires an evaluation process that is ongoing, including multiple sources of information, focuses on all levels of the organization, and which is based on actual changed behavior;
- Provides for system-wide coordination with a clearinghouse function; and
- Describes approaches to obtain the necessary funding to carry out staff development needs.

A.5.4: Develop a system for monitoring staff development throughout the district to ensure effectiveness (see Finding 9). Provide training to principals through an academy that is mission-focused, substantive in content, and required of all administrators. The primary focus needs to emphasize the following competencies:

- Instructional leadership skills to promote student achievement through the allocation of all resources;
- Implementing effective teacher evaluation techniques, (i.e., classroom observation, pre- and post-observation conferences, and analysis of data);
- Collecting and analyzing disaggregated test data to be used in making research-based decisions about curriculum and the implementation of appropriate interventions;
- Monitoring the development and implementation of an effective curriculum management process;
- Developing essential team-building skills necessary in promoting a climate and culture for quality learning for all students;
- Using leadership skills required to assist teachers in acknowledging the need for change and for adapting to changes;
- Developing competencies in the use of effective interpersonal skills;

- Developing skills in writing sound research-based proposals; and
- Developing skills in grouping strategies, curriculum alignment, and instructional supervision.

A.5.5: Upgrade the new teacher induction program for new employees that not only includes information about the system, but concentrates on enhancing new employees' appreciation for the diverse population of the district and developing their skills in providing meaningful learning for all students. This training should not be voluntary.

A.5.6: Provide sufficient financial resources within the budget process to accomplish this training process.

A.5.7: Establish that the building staff development coordinator and the building principal communicate closely in order to:

- Assure that the staff development plan portion of the Success for Every Student building plan contains results-based staff development mathematics training targeting all staff in mathematics;
- Assess the needs of the participants based on the established goals of the district, the building SES plan and student achievement data;
- Provide assistance to those providing training;
- Monitor the implementation of programs;
- Evaluate the program, using the feedback to influence future decisions;
- Provide follow-up assistance and reinforcement;
- Prepare a budget for the approval of the superintendent;
- Administer the budget; and
- Interpret the state and local regulations.

By developing an appropriate training program in the teaching of mathematics, the Montgomery County Public Schools can better assure continuity in curriculum and instruction, adequate skills, appropriate practice, and the quality of learning.

V. SUMMARY

A curriculum management audit is basically an "exception" report. That is, it does not give a summative, overall view of the suitability of a system. Rather, it holds the system up to scrutiny against the predetermined standards of quality, notes relevant findings about the system, and cites discrepancies from audit standards. Recommendations are then provided accordingly to help the district improve its quality in the areas of noted deficiency. In this case, the focus is on mathematics curriculum and instruction.

The leadership of the Montgomery County Public Schools is at a critical crossroads in the history of the school system. It will take assertive leadership to awaken many persons to the urgency of the changes required to retain the efficacy of the public schools. The district was fortunate to enjoy the energetic leadership of Dr. Jerry Weast and a re-energized Board of Education in confronting this major challenge to the continued viability of the school system.

There was much "good news" to report that was observed by the auditors. Overall, students in Montgomery County exceed the achievement levels of Maryland students and national students in mathematics. However, not all Montgomery County Public Schools students are experiencing success equally.

The identification of this achievement crisis in mathematics has enabled long-standing needs to emerge. Chief among them is the long-neglected issue of improving student achievement for all children, most noticeably the swelling ranks of low-income students and those with learning disabilities and other special education needs. The district's leadership must not only be bold but inclusive. It must reach out to segments of the community that do not believe they are heard. It must systematically listen and translate concerns into an effective change agenda that enjoys wide political support.

This is the responsibility of the Superintendent and the entire Board of Education. While there is an opportunity to "play politics" with the mathematics curriculum and there are those who champion an exclusionary and enriched program for the affluent and elite at the expense of others, the issues are too great and the consequences of failure too ominous not to come together on a workable change agenda that can lead to curriculum and instructional progress and equal success for all in mathematics education.

VI. APPENDICES

William K. Poston, Jr., Ed.D.

Dr. Bill Poston is Associate Professor of Educational Administration in the Department of Educational Leadership and Policy Studies at Iowa State University, Ames, Iowa. Dr. Poston is an experienced educator, with 30 years in the public schools including service as a mathematics teacher and principal. He served 15 years of his career as a superintendent in Montana and Arizona. He is a graduate of the University of Northern Iowa, and his graduate degrees are from Arizona State University. Dr. Poston remains the youngest person to ever serve as International President of Phi Delta Kappa (1979-1981).

He is the author and co-author of many articles and books, including "Making Schools Work," "Effective School Board Governance," "Making Governance Work," and "The Curriculum Audit: Improving School Quality," as well as numerous professional writings and articles. Dr. Poston received his curriculum audit licensure training in Montreal in 1988, and he is a member of the governing board and Executive Vice-President of Curriculum Management Audit Centers, Inc. He has personally led and conducted over 60 audits across the United States and in foreign countries.

Charles H. Chernosky, Ed.D.

Charles Chernosky is currently executive director for curriculum and instruction in the Coppell Independent School District in Coppell, Texas, a suburb of Dallas-Fort Worth. Dr Chernosky's career began in mathematics education, and he has served as a math educator and resource person throughout his career. He later served as director of elementary and secondary operations and instruction and as a principal at the secondary level in Texas.

Dr. Chernosky is active in numerous professional organizations and has served on the executive board of the Texas Association for the Gifted and Talented and the Texas Chapter of ASCD.

Dr. Chernosky earned his bachelors, masters, and doctoral degrees from the University of Houston. He has recognized expertise in effective strategies for instruction, program planning and evaluation, teacher evaluation and assessment, curriculum design and development, and strategic planning. He was trained as a Curriculum Management Auditor in San Antonio, Texas, in 1995.

Carla C. Kirkland

Carla Kirkland is currently serving as a national mathematics consultant and president of her own private consulting firm. She previously served as statistics director for the Office of Management Information Systems for the Mississippi Department of Education and the state mathematics specialist for the Office of Instructional Development for the Mississippi Department of Education. She is a former classroom teacher and has served in various leadership roles at the Piney Woods School and Jackson Public School District.

Carla is the past president of the Mississippi Council of Supervisors of Mathematics, has served on the Board of the Mississippi Council of Teachers of Mathematics and served as a committee member of the Mississippi Elementary Committee of Southern Association of Colleges and Schools.

She has conducted numerous seminars at the national, state and local levels and has recently been awarded two grants to provide statewide mathematics training on the Mississippi Framework 2000 and the Teacher Assistant Training on the Mathematics Supplement. She has also worked with the University of Hawaii and the Hawaii Algebra Learning Project as a mathematics consultant.

Gina Marx, M.S.

Gina Marx is currently Director of Staff Development and School Improvement for the South Central Kansas Education Service Center #628, located near Wichita, Kansas in the city of Clearwater. Her position is focused on helping school districts align and develop curriculum to meet the new standards in math and language arts set by the State of Kansas.

Gina is the coordinator for an annual conference for 2000 area teachers, and she heads a School Improvement Support Group and New Teacher Mentoring Group. Gina oversees inservice training for teachers at the center, as well as managing a team of consultants who provide on-site training for districts. She has earned a B.A. in Communications (Honor Graduate), M.S. in Secondary Educational Administration, and District Level Certification. Ms. Marx completed her audit training in Savannah, Georgia in January 1999.

Jacqueline K. Mitchell, Ph.D.

Dr. Mitchell is presently Executive Director of Research and Program Assessment in the DeKalb County School System, Decatur, Georgia. She was formerly a Professor in Educational Leadership at The University of Toledo, Toledo, Ohio, and at Iowa State University, Ames, Iowa. She completed her A.B. Degree at Fisk University, Nashville, Tenn.; her M.Ed. in The Instructional Process at Washington University, and her Ph.D. in Professional Studies, at Iowa State University. Dr. Mitchell is a certified lead curriculum auditor.

Dr. Mitchell has been a secondary classroom teacher and a high school administrator during her professional career. Her experiences include extensive work with K-12 schools engaged in restructuring efforts, curriculum design, and program improvement, particularly in mathematics and language arts. In addition, she is a trained Accelerated Schools Coach under the auspices of Stanford University and has acquired considerable training in the use of multiple intelligence theory in schools. Her research has examined the influence of principal/district influence on teaching efficacy. She completed her curriculum audit training in San Diego, California in January 1991.

Beverly Nichols, Ph.D.

Beverly Nichols is Coordinator of Evaluation and Assessment in Shawnee Mission, Kansas Public Schools. She has 40 years of experience in mathematics education and educational leadership, including administrative roles at the junior and senior high school levels and in curriculum and assessment. Dr. Nichols is also a former national math teacher of the year, selected by the National Council of Teachers of Mathematics. She has worked as a consultant with textbook companies and school districts across several states, providing assistance with staff development, curriculum development, and school improvement plans, particularly in the area of mathematics.

Dr. Nichols received her B.A. and M.A. from Arizona State University and her Ph.D. in curriculum and instruction from the University of Missouri at Kansas City. She has served on the board of directors as well as many committees of the National Council of Teachers of Mathematics. She received her curriculum audit training in Bloomington, Indiana and San Antonio, Texas.

Zollie Stephenson, Ph.D.

Zollie Stephenson, Jr. is a research director for the U.S. Department of Education in Washington, D.C. He is formerly the Director of Assessment for the Baltimore City Public Schools. He has previously served as Chief of Staff/Executive Assistant for Administration, Executive Director for Educational Support Services, and Director of Research and Evaluation for the District of Columbia Public Schools. He was Director of Research and Evaluation for the Charlotte/Mecklenburg school system and served as the Research Project Officer for the HIV/AIDS education at the Division of Adolescent and School Health, Center for Disease Control and Prevention, Atlanta, Georgia.

Dr. Stephenson is an adjunct professor in educational leadership at the George Washington University and Western Maryland College where he teaches assessment and research methods to graduate education students. He is a member of the National Assessment of Educational Progress Validation Studies Panel and has served for six years on the Editorial/Advisory Board of the Journal of Negro Education. Dr. Stephenson earned a Ph.D. at the University of North Carolina at Chapel Hill. He received his curriculum management audit training in Monterey, California in 1992.

Appendix B

Characteristics of Good Policies and Regulations on Curriculum Management (Mathematics and Other Subject Areas)

Effective and appropriate board policies include written statements that provide direction and carry out the following. The policies need to:

1. **Provide for <u>Control</u> by requiring:**
   - 1.1. An aligned written, tested and taught curriculum
   - 1.2. Philosophical statements of curriculum design approach
   - 1.3. Board adoption of the curriculum
   - 1.4. Accountability through roles and responsibilities
   - 1.5. Long-range system-wide planning
2. **Provide for <u>Direction</u> by requiring:**
   - 2.1. Written curriculum for all subject/learning areas
   - 2.2. Periodic review of the curriculum
   - 2.3. Textbook/resource alignment to curriculum and assessment
   - 2.4. Content area emphasis
   - 2.5. Program integration and alignment to curriculum
3. **Provide for <u>Connectivity and Equity</u> by requiring:**
   - 3.1. Predictability of the written curriculum from one level to another
   - 3.2. Vertical articulation and horizontal coordination
   - 3.3. Training for staff in the delivery of the curriculum
   - 3.4. Delivery of the curriculum
   - 3.5. Monitoring of the delivery of the curriculum
   - 3.6. Equitable access to the curriculum
4. **Provide for <u>Feedback</u> by requiring:**
   - 4.1. A student and program assessment plan
   - 4.2. Use of data from assessment to determine program and curriculum effectiveness
   - 4.3. Reports to the Board about program effectiveness
   - 4.4. Use of data to determine effectiveness of all district functions
5. **Provide for <u>Productivity</u> by requiring:**
   - 5.1. Program-centered budget with needs-driven allocations
   - 5.2. Resource allocation tied to curriculum priorities
   - 5.3. Environment to support curriculum delivery
   - 5.4. Support systems focused on organizational purpose
   - 5.5. Data-driven decisions for the purpose of increasing student learning
   - 5.6. Change processes for long-term capacity building.

Appendix C

Sample Curriculum Articulation Plan (Mathematics K-12)

Subject: Mathematics

Grade Levels: K-12; Strand: Numeration

Program Goal: 7. To Understand The Relationships of Numbers to Each Other

Objective	K	1	2	3	4	5	6	Tma	Alg	Geo	AdA	Pca	Cal
.01 Ordinal numbers	I	E	M	R									
.02 Place Value		I	E	E	E	M	MM						
.03 Odd and Even Numbers		I	E	M	R	R	R						
.04 Prime and composite numbers						I	E	M	MM				
.05 Number Comparisons	I	E	E	E	M	MM	MM						
.06 Decimal, percent, whole number, fraction Equivalents				I	E	E	M	MM					
.07 Rounded numbers			I	E	M	MM	MM						
.08 Expanded notation				I	E	M	MM						
.09 Added Inverse and absolute value							I	E	M				

I = Introduce E = Expand M = Mastery Expected R = Reinforce MM = Mastery Maintained
Tma = Transitional math Alg = Algebra Geo = Geometry AdA = Adv. Algebra Pca = Pre Calculus
Cal = Calculus

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Appendix D

Sample Curriculum and Instructional Program Evaluation Policy

Systematic program evaluation serves three purposes: (1) to determine if the curriculum meets district standards, (2) to determine if student achievement or curriculum objective meets or exceeds district expectations, and (3) to determine if the instructional program is effective in meeting curriculum objectives.

In conducting program evaluation, two components must be considered -- curriculum and instruction. Curriculum is defined as determining the objectives of the system. Instruction is deciding on the procedures for accomplishing the objectives. Curriculum program evaluation will focus on the student learnings and objectives specified for all subject areas, grades Kindergarten through twelve. The content of the curriculum is outlined in a scope and sequence chart for each subject area. In most areas, corresponding assessment tools are available.

Instructional program evaluation will focus on the manner in which student achievement objectives are met. The instructional program includes such variables as the amount of instructional time, the instructional materials and resources used, methods of teaching the content or skills, and supplemental support services and programs.

Program evaluation efforts will take place when scope and sequence charts are available using the timelines outlined in the district's five-year plan for curriculum review. The five-year plan identifies by year curriculum areas that are in the phases of "planning, design and tryout, program evaluation, design revision, and implementation."

A. Curriculum Program Evaluation Criteria

There are four criteria levels to be used in curriculum program evaluation. A description of the levels and the evaluation criteria follow.

Level 1: Curriculum Completeness

On an annual basis the entire curriculum will be reviewed to determine if all needed subject areas are included, and if instructional time allocations are appropriate. Subjects will be added or deleted, and time allocations will be modified as a result of the evaluation.

The evaluation criteria are:

- A course of study has been outlined for all curriculum subject areas considered necessary for students' present and future functioning in society.
- The amount of instructional time allowed to each subject area corresponds to priorities of the community/governing board.

Level 2: Subject/Strand Completeness

Each curriculum subject area or strand will be evaluated on a cyclical basis according to the district's five year for curriculum review. Modifications will be made if the evaluation criteria are not met.

The evaluation criteria are:

- All strands on the subject area have been identified.
- Strands have been "weighted' in terms of relative importance.
- "Weighting" of strands corresponds to students' developmental needs and societal expectations.

Level 3: Subject/Strand Quality

Content and placement of objectives (scope and sequence) within each subject and strand area will be evaluated on a cyclical basis according to the same schedule for Level 2.

The evaluation criteria are:

1. Students needs and interests are reflected in the objectives.
2. Competencies needed to function in society are included in the objectives when appropriate.

3. Recent research and knowledge related to the content of the subject/strand are reflected in the objectives.
4. Objectives are consistent with district philosophy and community values.
5. The sequence of objectives and assignments to grade levels are developmentally appropriate.

Level 4: Student Achievement of Subject/Strand Learnings

Evaluations will be conducted using an established time frame to determine if students at each grade level have acquired the knowledge and skills identified in the scope and sequence. In the basic skill areas, evaluations will be conducted annually. In all others subject/strand areas, evaluations will take place according to the schedule outlined in the District's Five-year Plan for Curriculum Review. An evaluation schedule will be developed and published across the system.

The evaluation criteria are:

1. Survey level measures of student achievement of curriculum objectives are appropriate.
   a. Tests cover an adequate number of objectives from a given curriculum area.
   b. Test items measure learning outcomes described in curriculum objectives.
   c. Mastery criteria are appropriate.
2. A majority of students enrolled in the district achieve mastery of. Identified grade level objectives.
   a. At each grade level at least 75 percent of students in the district master 70-100 percent of tested curriculum objectives in a given strand.
   b. At least 75 percent of students receiving instruction below or above grade level will master 70-100 percent of instructional objectives derived from assessing student performance on off-grade level curriculum objectives.
   c. Demographic characteristics of students not meeting grade level mastery criteria reflect the same demographic characteristics as the total school population.
3. A majority of the students in the district meet national achievement standards.
   a. At least one-half of the total number of students in the district rank at or above the 50th national percentile rank on the Iowa Tests of Basic Skills.
   b. No more than one-quarter of the total number of students in the district rank at or below the 25th percentile on national percentile rankings on the Iowa Tests of Basic Skills.

B. Instructional Program Evaluation Criteria

The instructional program defines the means by which students will acquire the knowledge and skills specified in the curriculum. The two levels of instructional program evaluation are quality and effectiveness. These are described below.

Level 1: Instructional Program Quality

In evaluating the quality of the instructional program the major question being addressed is whether or not personnel at the district and school levels are providing an adequate instructional program.

1. District level evaluation criteria:
   a. Courses of study guides are provided for each curriculum area that includes grade level performance objectives and recommended instructional time allocations.
   b. Enough staff and other needed support staff members are provided for each school.
   c. Adequate resources are provided for instructional materials.
   d. Instructional support services are provided.
   e. Staff training needs are assessed and necessary training provided.
2. School/classroom evaluation criteria:
   a. Teachers are teaching to the objectives specified in the curriculum.
   b. Teachers are following recommendations for instructional time allocations.
   c. Instructional materials and resources are available and are used appropriately according to learning outcomes specified in objectives.

d. Teachers assess student performance related to specified objectives and use evaluative data to plan instruction.

e. Teachers use principles of learning in delivery or instruction.

f. Student performance is routinely monitored and records are kept.

g. Remediation is provided when needed.

h. Instructional interventions are evaluated to determine if student achievement is influenced.

i. A plan for use of support services is developed and is operational.

Level 2: Instructional Program Effectiveness

The primary measure of effectiveness is student achievement or the District student achievement standards are being met (refer to Curriculum Program Evaluation - Level 4), then the instructional program is judged to be effective. If standards and expectations are not being met at both the District and school levels, intervention should be planned which corresponds to the outcomes of the instructional program evaluation, Level 1.

C. Curriculum and Instructional Program Evaluation Procedures

The Superintendent will be responsible for designing, planning, implementing, and supervising the evaluation of the curriculum and instructional program.

Curriculum

The "Five-year Plan of Curriculum Review" outlines a schedule for planning designing, implementing, and evaluating individual curriculum areas in the program. In the "planning" phase of the cycle, the scope and sequence of a specified curriculum strand will be reviewed and evaluated according to the criteria outlined for Levels 2 and 3 of Curriculum Evaluation of this policy.

In the "design" year phase, curriculum revisions will be made according to the recommendations resulting from the above evaluation. A draft version of the revised scope and sequence will be submitted to the board for interim adoption if needed. The final activity in the "design" phase will be the development or refinement if needed, of an evaluation tool to be used to measure student achievement of a sample of curriculum objectives. The criteria outlined in Level 4, Curriculum Evaluation, of this policy should be applied in the development of this evaluation tool.

In the third year of the cycle a "try-out" of the scope and sequence and evaluation tool will be conducted if major refinements have taken place in those cases where there are major changes and when possible, pilot schools and/or classes will be identified for the "try-out" phase of development. Student performance data and evaluative feedback from teachers at pilot sites will form the basis for the final revision of the pilot scope and sequence.

At the end of the third year the final version of the scope and sequence will be presented for board adoption for the entire district.

During the "program implementation" phase of the "Five-year Plan for Curriculum Review," student achievement data will be gathered and analyzed according to the criteria specified in Level A (curriculum evaluation) of this policy.

Instructional Program

Student achievement data will be analyzed according to the time frame specified in the schedule of assessment. The instructional program will be evaluated according to criteria outlined in Levels 1 and 2, (instructional program evaluation) of this policy.

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